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Biological Resources

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RESULTS OF PROTOCOL SURVEYS FOR NESTING GOLDEN EAGLES (*AQUILA CHRYSAETOS*) CONDUCTED IN ASSOCIATION WITH THE PROPOSED PANOCHE VALLEY SOLAR FARM PROJECT LOCATED IN THE PANOCHE VALLEY, UNINCORPORATED SAN BENITO COUNTY, CALIFORNIA.

Bloom Biological, Incorporated
November 14, 2010

Bloom Biological, Incorporated (BBI) was retained by Solargen Energy, Incorporated (Solargen) in cooperation with Live Oak Associates, Inc. to conduct surveys for Golden Eagle (*Aquila chrysaetos*) nests in the vicinity of the proposed Panoche Valley Solar Farm Project (PVSF), located in the Panoche Valley in unincorporated San Benito County, California. This report discusses the BBI's survey methods, results and recommendations.

PROPOSED PROJECT DESCRIPTION

The 4,885-acre project site is located in eastern San Benito County in the Panoche Valley, approximately 15 miles west of Highway 5 and along Little Panoche Road (also known as West Shields Road). Specifically, the project is located in Township 15S, Range 10E, Sections 3-4, 8-11, and 13-16 and Township 15S, Range 11E, Section 19 of the USGS *Cerro Colorado*, *Llanada*, *Mercy Hot Springs*, and *Panoche* 7.5-minute topographic quadrangle maps.

The topography of the site descends gradually to the east-southeast with sloping gradients up to approximately 11 percent. The site elevation ranges from approximately 1,250 feet above mean sea level near the southeast end of the site to approximately 1,400 feet above mean sea level near the west end. The site is surrounded by rangeland and bordered to the west by the Gabilan Range and to the east by the Panoche Hills. Both Panoche Creek and Las Aguilas Creek traverse the project site. In addition, there are several unnamed washes located throughout the site.

There is no urban development within the project site or surrounding area. The nearest rural community is approximately 15 miles from the perimeter of the project site. Previously, much of the project site was used for crop production; however, for approximately the past forty years, the project site and the surrounding area have been used for grazing. Vegetation is low-lying and sparse and primarily consists of annual nonnative grass species.

Like much of California, the site and surroundings experience a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall, and is characterized as high desert. Annual precipitation in the general vicinity of the site ranges between 9 and 13 inches, almost 85 percent of which falls between October and March. Nearly all precipitation falls in the form of rain. Stormwater runoff readily infiltrates the sites' soils; when field capacity has been reached, gravita-tional water flows into the creeks and drainages.

REASON FOR SURVEYS

The Golden Eagle is an uncommon permanent resident and migrant throughout most of California's foothills, mountains, sage-juniper flats and deserts (CDFG 2008), and is protected under the federal Bald

and Golden Eagle Protection Act and by the California Department of Fish & Game as a Fully Protected Species. Golden Eagle status studies completed as recently as 1989 suggested a stable population for much of the western United States (Harlow and Bloom 1989), however, recent evidence suggest that eagle numbers in the western United States are now declining. As a result, the U.S. Fish and Wildlife Service (Service) is recommending focused surveys in nesting habitat within ten miles of proposed projects that might cause anthropogenic disturbances to eagles. Future recommendations regarding Golden Eagle wintering and migratory habitat use are being developed.

METHODS

The Service has recently recommended (Pagel et al. 2010) the following four tasks to determine the likely effects of a project or activity on eagles:

A. Collection and synthesis of biological data.
B. Identifying activities that are likely to result in take.
C. Avoidance and minimization measures.
D. Quantifying the anticipated take.

BBI's typical survey approach follows recommendations made in the U.S. Fish and Wildlife Service's (Service) Interim Golden Eagle inventory and monitoring protocols (Pagel et al. 2010), which recommend two surveys for eagle nests by helicopter. The first (Phase 1) is normally conducted in March and the second (Phase 2) in late April/early May. The Service notes that helicopter surveys are an accepted and efficient means to monitor large areas of habitat, to inventory potential habitat, and monitor known territories (Pagel et al. 2010), as eagles nest on cliffs or large trees in open areas and build a large platform nest often initially 10 feet across and 3 feet high of sticks, twigs and greenery (CDFG 2008). Because of their large size, these nests, particularly when active, are easy to spot at a great distance from the air and in California can be distinguished from Red-tailed Hawk (*Buteo jamaicensis*), Common Raven (*Corvus corax*) and Bald Eagle (*Haliaeetus leucocephalus*) by biologists experienced with the nests of those species. The Phase 2 survey can be conducted on foot if feasible. The purpose of the surveys is to record and report occupancy (Phase 1) and productivity (Phase 2) of resident golden eagles including, but not limited to, the following:

- individual activities,
- nests and territories on and surrounding the subject solar farm project, and within an approximate 4- to 10-mile radius of the proposed project (assumed Service requirement).

The Golden Eagle surveys conducted in 2010 for the PVSF were conducted outside of the survey window recommended in the Service's guidelines, however, the specific surveys conducted by BBI were approved by the Service with the caveat that spring surveys would likely still be recommended and that any Golden Eagle nest trees or nest cliffs found may need to be climbed to verify species and nest success. The potential survey area included the project site and all lands within a ten mile radius surrounding the project site, with a particular emphasis on topographic features and large power line rights-of-way where Golden Eagles are likely to be located.

Because of the late date that surveys were being conducted, BBI gathered as much data as possible about Golden Eagle locations and use of the area over the course of two days of helicopter surveys conducted on August 6 and 7, 2010. Flight times were nine and five hours, respectively. Both surveys followed the helicopter survey methodology described in Section VII.b Aerial Surveys of Pagel et al. (2010). Surveys were conducted by BBI biologists Peter H. Bloom (seated in the front of the helicopter) and Scott Thomas (seated in the rear). Two GPS units, 1 primary and 1 backup, were used to document geographic locations of importance and the routes taken. The survey duration was adequate to cover the entire area and examine

detectable large stick nests for the presence of inactive and active Golden Eagle nests. Nests of all raptor species and corvids that could be detected were documented.

SURVEY LIMITATIONS

The western 50% of the survey area contained highly variable hilly topography and was cloaked in oak woodlands and oak savannah that include at least Blue Oaks (*Quercus douglassiana*) and Valley Oaks (*Q. lobata*), both common nesting substrates for Golden Eagles and Red-tailed Hawks (*Buteo jamaicensis*) in this region (Bloom unpub. & Tietje et al. 1998). Both tree species are deciduous. But because nesting surveys were performed in August, essentially all live trees were fully leafed out and only a moderate percentage could be accurately surveyed.

The survey accuracy was also weakened because all nesting pairs of Golden Eagles and Red-tailed Hawks in this region had fledged their young by August 1. As a result, the identity of nest ownership could not be precisely known in the case of some nests because no chicks, incubating or brooding adults or other important nest identifiers could be used. However, the summer 2010 preliminary results are unequivocal; there is a high density of nesting Golden Eagles and other raptors and ravens surrounding Panoche Valley but relatively few actually on the valley floor.

RESULTS

A total of 169 large bird (raptor or corvid) nests were detected during the survey, including 15 Golden Eagle nests (see Table II, end of document). Of the 15 Golden Eagle nests, nine were determined to have been active in 2010. Based on the location and distribution of these nests, BBI estimates that these 15 nests represent at least nine active Golden Eagle territories within ten miles of the PVSF. Based upon the quantity and quality of oak woodland and oak savannah habitat in the western half of the study area, it is likely that several more Golden Eagle nesting territories and their nests have yet to be discovered.

Also detected during the survey were 111 Common Raven nests, 1 Turkey Vulture nest, 1 Barn Owl nest, 1 Great Horned Owl nest, 16 Prairie Falcon nests and 24 Red-tailed Hawk nests. A complete list of wildlife observed in the survey area is shown below in Table I.

Table I. Wildlife Species Observed During the Survey

Species	Scientific Name	Notes
Birds		
Golden Eagle	*Aquila chrysaetos*	(2) Panoche Valley (3) Valley de Aquila
Red-tailed Hawk	*Buteo jamaicensis*	
Prairie Falcon	*Falco mexicanus*	
Barn Owl	*Tyto alba*	
Great Horned Owl	*Bubo virginiaus*	
American Kestrel	*Falco sparverius*	Abundant in cliffs
Road Runner	*Geococcyx californicus*	
Common Raven	*Corvus corax*	
Chukar	*Alectoris chukar*	
Mourning Dove	*Zenaida macroura*	
Rock Dove	*Columbia livia*	
Mammals		
Bobcat	*Lynx rufus*	
Mule Deer	*Odocoileus hemionus*	

Coyote	*Canus larans*
Gray Fox	*Urocyon cinereorgenteus*
Black-tailed Jack Rabbit	*Lepus californicus*
Audubon's Cottontail	*Sylvilagus audubonii*
California Ground Squirrel	*Spermophilus beecheyi*

DISCUSSION

Natural History

Kochert *et al.* (2002) provided a thorough description of the natural history of the Golden Eagle, noting that the species is found in numerous habitats located in a wide range of latitudes throughout the Northern Hemisphere. In North America, Golden Eagles are most common in the western half of the continent near open spaces that provide hunting habitat, and generally with cliffs present for nesting sites. While northern populations of the species are migratory, often making trips of thousands of miles to the wintering grounds; southern populations (including those in southern California) tend to be resident year-round.

While Golden Eagles are capable of killing large prey such as cranes, wild ungulates, and domestic livestock, they primarily subsist on rabbits, hares, ground squirrels, and prairie dogs (Bloom and Hawks 1982, Olendorff 1976). Golden Eagles typically reach sexual maturity, form territories and begin nesting at about five years of age. Pairs generally stay within the limits of their territory, which can measure 10–30 square kilometers, and within that territory can be as many as 14 nests (Bloom pers. obs.) which a pair maintains and repairs as part of their courtship. Over the course of a decade several of these nests will be used and will produce young, others may only be added to with fresh sticks. Most alternate nests are important in the successful reproduction of a pair of eagles. Kochert et al. (2002) also noted that the nesting season is prolonged, extending more than 6 months from the time the 1-3 eggs are laid until the young reach independence. A typical Golden Eagle raises an average of only 1 young per year and up to 15 young over its lifetime. Pairs commonly refrain from laying eggs in some years, particularly when prey is scarce. The number of young that Golden Eagles produce each year depends on a combination of weather and prey conditions. The black-tailed jackrabbit is a key prey species throughout much of the range, and eagle reproductive rates fluctuate with jackrabbit population cycles.

Adverse Effects of Energy Projects

While there is currently an effort to build a larger "sustainable" energy infrastructure in the United States and abroad with expected fewer overall environmental effects than the existing hydrocarbon-based infrastructure, conservation biologists are still in the process of establishing what effects alternative energy plants might have on the environment at the local level. It is well-established that Golden Eagles and other raptors are vulnerable to mortality through collision with wind turbines (Orloff and Flannery 1992, PBRG 1997, Madders and Walker 2002). For solar facilities, potential effects on wildlife are in the early stages of investigation, but it is expected that raptors and other species could suffer adverse effects due to reduced foraging habitat, electrocution from distribution lines and potentially, a reduction in the prey base also caused by habitat loss for prey species. In the case of the proposed PVSF, the project has the potential to have the following effects on Golden Eagles:

- **Direct Mortality -** Long-term surveys of Golden Eagle populations have shown declines in nesting populations throughout the western United States (Kochert and Steenhof 2002). Franson et al. (1995) found that humans cause >70% of recorded deaths, with the leading causes being accidental trauma (collisions with vehicles, power lines, or other structures, 27%), electrocution

(25%), gunshot (15%), and poisoning (6%). Lead poisoning in California has also been identified as an important mortality factor with > 30% of a population having elevated levels (Bloom et al. 1989, Pattee et al. 1990).

Electrocution is a particular risk potentially posed by the PVSF. Golden Eagles are vulnerable to electrocution when landing or taking off from power poles, when defecating from power poles, or when two eagles perch on the same pole, with the risk increasing when inclement weather hampers flight or when wet feathers increase conductivity (Avian Power Line Interaction Committee 1996). Harness and Wilson (2001) reported that ≥272 Golden Eagle electrocution deaths occurred in western North America From 1986 to 1996. In areas lacking natural perches such as the area surrounding the PVSF; poles with cross arms diagonal or parallel to prevailing winds are most lethal (Benson 1981, Harness and Wilson 2001).

- **Nest Failures -** Golden Eagles may desert nests in early incubation if disturbed by humans (Bloom 1974, Thelander 1974), and potential desertion may not be noticed early through behavioral cues as Golden Eagles are not aggressive toward humans in the nest vicinity and will simply leave and not return to the area for hours (Camenzind 1969), if ever. While it is unlikely that project development would cause such an effect directly given the location of most nests relative to the proposed project site, project implementation could contribute to cumulative or growth-inducing impacts, ultimately causing additional anthropogenic disturbance in the area over time. Fifteen Golden Eagle nests were detected during the survey at distances of 3.1 to 10 miles from the proposed project's boundary (see Table II). Increased recreation including the use of dirt roads, off-road vehicle use, rock climbing, and target shooting are all linked to nest failures and over the long-term, complete nest territory abandonment.

- **Indirect Mortality –** Management of healthy eagle populations requires maintaining prey habitat in foraging areas (Kochert et al. 2002) as the availability of food and nesting sites is the primary factor determining nesting density of Golden Eagles (Hunt et al. 1995) and reproductive rates of Golden Eagles often fluctuate with prey densities (Smith and Murphy 1979, Tjernberg 1983, Bates and Moretti 1994, Steenhof et al. 1997, McIntyre and Adams 1999). In southwestern Idaho, Marzluff et al. (1997) have found that behavior and demography of Golden Eagles are closely associated with the abundance of black-tailed jackrabbits (*Lepus californicus*), which are themselves dependent on stands of sagebrush/rabbitbrush interspersed with grassland (Knick and Dyer 1997). Bloom and Hawks (1982), working in the Great Basin Desert of northeast California and northwest Nevada found that 91% of the biomass and 85% of the frequency of prey found in nests were attributed to lagomorphs. Patch sizes of this habitat were found to be an essential feature of Golden Eagle home ranges (Marzluff et al. 1997). Both rabbitbrush and black-tailed jackrabbits are present in the study area, and could potentially be adversely affected by construction of the PVSF within the project's footprint, and perhaps further from the site due to increased anthropogenic disturbance to the surrounding area.

Mitigating Potential Adverse Project Effects

It is BBI's opinion that as several Golden Eagle nests exist within 2.0 miles of the Panoche Valley floor that the habitat quality is relatively high. The project's impacts on nesting Golden Eagles may be moderately high. However, given the potential for impacts caused by the project to this or other future Golden Eagle pairs, it is highly recommended that mitigation be incorporated into the project to reduce the potential for project-initiated direct and indirect mortality or nest failure. BBI recommends the following measures be taken into consideration:

- Permanent conservation of land surrounding certain nest sites to ensure future development or other land uses directly or indirectly caused by the project do not impact vulnerable eagle nest locations.

- Lead bullets, lead bullet fragments, and lead pellets from hunting cause unnecessary deaths of Golden Eagles, Bald Eagles, California Condors and other raptors. Support regional as well as the State-wide ban of the use of lead bullets for hunting in California.

- Permanent conservation of on-site and/or off-site natural foraging habitat.

- Many hundreds of acres of lowland non-native grasslands cover the valley floors with little or no native shrub species used for foraging and cover by lagomorphs. Investigate the potential for habitat improvement (native shrub restoration) of keystone prey species preyed upon by Golden Eagles.

- Large numbers of raptorial birds, including Golden Eagles are electrocuted annually. Replace existing dangerous utility lines with raptor-safe designs within the 10 mile radius survey area and ensure that all new lines be raptor-safe or underground (Avian Power Line Interaction Committee 1996).

- The lack of knowledge of nesting Golden Eagle populations is hampering efforts to strategically locate energy projects; hence more data is needed on productivity, natal dispersal, home-range size, and habitat use of Golden Eagles in coastal California. BBI proposes annual productivity monitoring for the nests of the approximately nine known Golden Eagle pairs and banding of all young produced. This work should occur during the remaining pre-construction period and 10 years post-construction.

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Table II. Survey Results

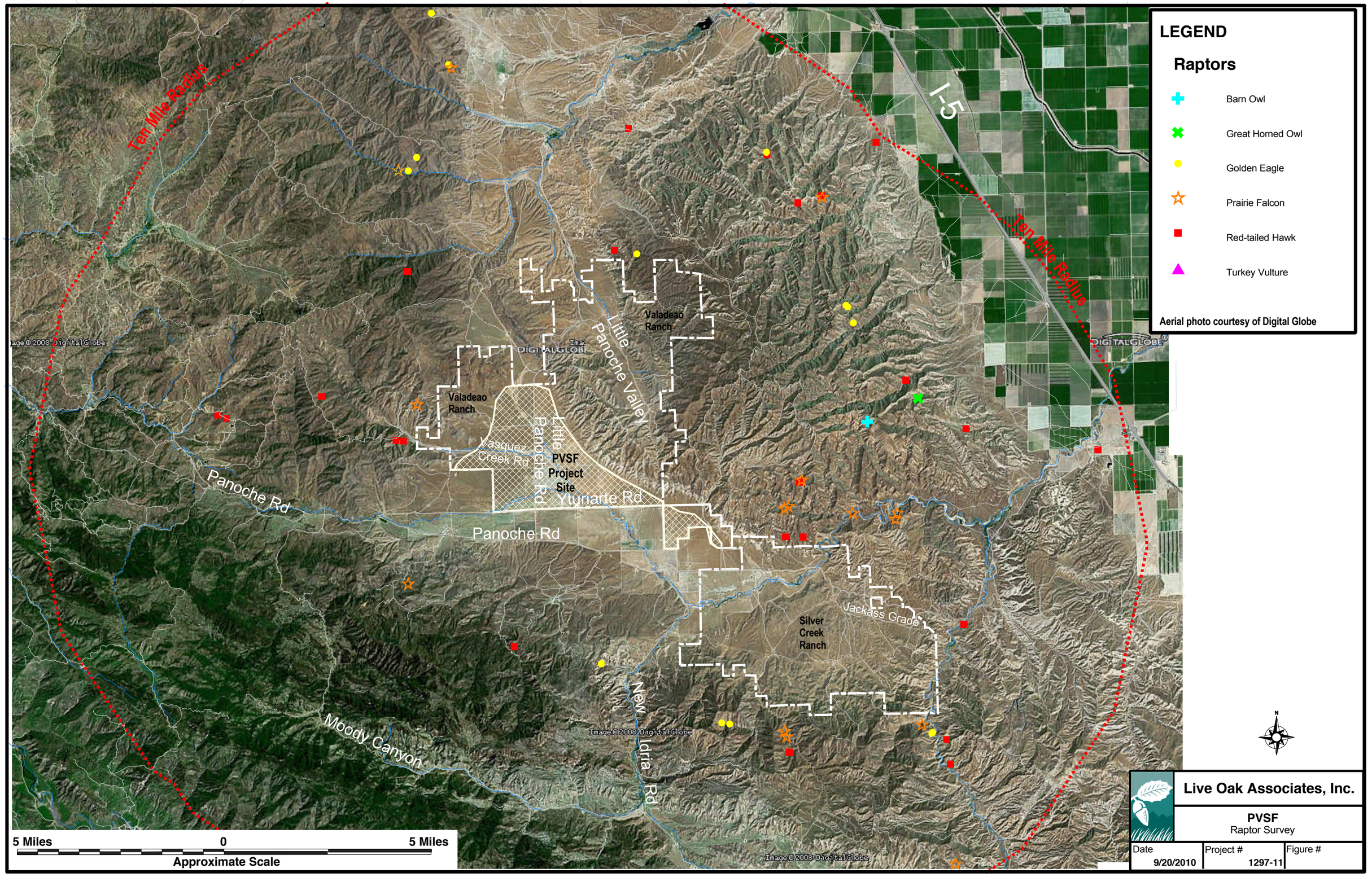
The following table shows the full results of BBI's survey. Nests are listed in order by distance from the site boundary. Distance was calculated using the ST_Distance spatial query function in PostGIS and converted to miles.

Species	Point	Easting	Northing	Substrate	Status	Notes	Distance From Site
Common Raven	39	688871	4056213	Power Tower	Active		0
Common Raven	35	693728	4054673	Power Tower	Active		0
Common Raven	36	693064	4054891	Power Tower	Active		0
Common Raven	37	692631	4055012	Power Tower	Active		0
Common Raven	38	689203	4056102	Power Tower	Inactive		0
Common Raven	41	687559	4056651	Power Tower	Active		0
Common Raven	40	687907	4056543	Power Tower	Active		0
Common Raven	34	695043	4054255	Power Tower	Active		0
Common Raven	33	696774	4053788	Power Tower	Inactive		0.13
Common Raven	42	687200	4056752	Power Tower	Active		0.14
Common Raven	183	696418	4054891	Cliff	Active		0.47
Common Raven	43	686473	4056931	Power Tower	Active		0.51
Common Raven	169	697367	4052220	Tamarisk	Active		0.58
Common Raven	44	686106	4056965	Power Tower	Active		0.69
Common Raven	32	698204	4053569	Power Tower	Inactive		0.81
Common Raven	45	685832	4056998	Power Tower	Inactive		0.84
Common Raven	184	696971	4055418	Cliff	Inactive		0.94
Common Raven	168	692322	4052926	Power Pole	Active		1.03
Common Raven	31	698623	4053519	Power Tower	Active		1.06
Red-tailed Hawk	46	684890	4057086	Power Tower	Active		1.38
Red-tailed Hawk	30	699365	4053469	Power Tower	Active		1.51
Red-tailed Hawk	47	684609	4057118	Power Tower	Active		1.55
Prairie Falcon	181	685412	4058501	Cliff	Active	Built on an old eagle nest	1.67
Prairie Falcon	185	699331	4054545	Cliff	Active	May be a duplicate	1.69
Prairie Falcon	106	699470	4054645	Cliff	Active	Barn Owl active on same cliff	1.8
Red-tailed Hawk	29	700027	4053450	Power Tower	Active		1.92
Common Raven	105	699652	4054959	Cliff	Inactive		1.99
Red-tailed Hawk	107	699894	4055536	Cliff	Inactive		2.32
Prairie Falcon	108	699974	4055640	Cliff	Active	On top of old Common Raven nest	2.4
Prairie Falcon	188	685074	4051709	Cliff	Active		2.63
Common Raven	191	688859	4049498	Cliff	Inactive		3.07
Golden Eagle	198	692387	4048663	Cliff	Active	Fledged young in 2010	3.09
Prairie Falcon	117	701901	4054384	Cliff	Active		3.16
Red-tailed Hawk	190	689089	4049317	Cliff	Active		3.19
Common Raven	196	694130	4047790	Cliff	Inactive		3.27
Common Raven	52	692975	4063678	Cliff	Active	Built on an old eagle nest	3.29
Common Raven	200	692333	4048249	Cliff	Active		3.33
Common Raven	54	693135	4063689	Cliff	Inactive		3.35
Common Raven	55	692757	4063984	Cliff	Inactive		3.4
Common Raven	197	693563	4047553	Cliff	Active		3.48

Species	Point	Easting	Northing	Substrate	Status	Notes	Distance From Site
Red-tailed Hawk	182	681810	4058771	Blue Oak	Active	Large enough that it could be a Golden Eagle nest	3.56
Red-tailed Hawk	180	685046	4063501	Cliff	Active	Fledged young in 2010 – Large enough to be a Golden Eagle nest	3.57
Red-tailed Hawk	56	692890	4064296	Cliff	Active	May be a Red-tailed Hawk or Golden Eagle	3.61
Golden Eagle	53	693736	4064176	Cliff	Old	May be a Red-tailed Hawk or Golden Eagle	3.8
Common Raven	189	689836	4048170	Cliff	Inactive		3.94
Golden Eagle	120	696951	4046424	Cliff	Inactive		4.12
Prairie Falcon	109	703509	4054159	Cliff	N/A	Roost location only	4.12
Common Raven	114	703260	4055283	Cliff	Inactive		4.13
Golden Eagle	121	697251	4046384	Cliff	Active	Fledged young in 2010	4.15
Prairie Falcon	110	703593	4054396	Cliff	Active		4.19
Common Raven	122	697518	4046337	Cliff	Inactive		4.19
Common Raven	125	699082	4046628	Cliff	Active		4.21
Common Raven	124	697580	4046261	Cliff	Inactive		4.24
Common Raven	113	703713	4054666	Cliff	Inactive		4.3
Common Raven	115	702487	4057702	Cliff	Inactive		4.42
Barn Owl	116	702461	4057828	Cliff	Active		4.46
Prairie Falcon	126	699328	4046136	Cliff	Inactive		4.55
Prairie Falcon	127	699403	4045918	Cliff	Active		4.69
Common Raven	128	699467	4045893	Cliff	Active		4.72
Common Raven	192	688324	4046715	Cliff	Inactive		4.78
Common Raven	111	703939	4056476	Cliff	Active		4.79
Common Raven	112	703899	4056958	Cliff	Inactive		4.9
Common Raven	129	699772	4045643	Cliff	Active		4.93
Red-tailed Hawk	130	699510	4045316	Cliff	Active		5.07
Red-tailed Hawk	48	678196	4057954	Power Tower	Active		5.51
Golden Eagle	177	685080	4067308	Cliff	Inactive		5.58
Common Raven	178	684870	4067237	Cliff	Inactive		5.59
Common Raven	101	697224	4065076	Cliff	Inactive		5.66
Prairie Falcon	179	684706	4067346	Cliff	Active		5.7
Red-tailed Hawk	49	677862	4058063	Power Tower	Active	Inactive Common Raven on same tower	5.72
Great Horned Owl	93	704389	4058705	Cliff	Active		5.74
Red-tailed Hawk	96	703911	4059398	Cliff	Active		5.78
Golden Eagle	176	685397	4067819	Cliff	Active	3 Golden Eagle nests on same face - 1 Active	5.8
Golden Eagle	98	701925	4061559	Cliff	Inactive	2 Inactive Golden Eagle nests 50 feet apart	5.84
Red-tailed Hawk	167	706109	4050149	Cliff	Active		5.98
Common Raven	28	706489	4054862	Power Tower	Active		6.02
Golden Eagle	99	701721	4062161	Cliff	Active		6.06
Golden Eagle	100	701658	4062219	Cliff	Active	Probably same pair as 099	6.07
Common Raven	148	703193	4045429	Cliff	Active		6.13
Common Raven	149	703446	4045525	Cliff	Inactive		6.18
Prairie Falcon	150	704534	4046371	Cliff	Active		6.29
Red-tailed Hawk	95	706197	4057552	Cliff	Inactive		6.35
Common Raven	94	706251	4057529	Cliff	Inactive		6.37

Species	Point	Easting	Northing	Substrate	Status	Notes	Distance From Site
Common Raven	165	704817	4046505	Cliff	Inactive		6.37
Common Raven	187	678902	4049482	Cliff	Inactive		6.39
Red-tailed Hawk	103	693419	4068923	Eucalyptus	Active		6.42
Common Raven	166	705217	4046831	Cliff	Active		6.43
Common Raven	164	705000	4046372	Cliff	Inactive		6.51
Golden Eagle	152	704906	4046035	Cliff	Active		6.6
Golden Eagle	151	704940	4046075	Cliff	Inactive		6.6
Common Raven	102	694520	4069158	Eucalyptus	Inactive		6.79
Common Raven	153	705126	4045728	Cliff	Active	Barn Owl active on same cliff	6.83
Common Raven	163	705268	4045775	Cliff	Active		6.87
Common Raven	162	705497	4045981	Cliff	Active		6.9
Common Raven	161	705539	4045909	Cliff	Active		6.95
Red-tailed Hawk	160	705463	4045797	Cliff	Inactive		6.96
Common Raven	104	693691	4069783	Cliff	Inactive		6.98
Common Raven	50	675894	4058585	Power Tower	Inactive		6.99
Common Raven	159	705294	4045169	Cliff	Active		7.14
Common Raven	50	675526	4058678	Power Tower	Inactive		7.23
Common Raven	87	699929	4065879	Cliff	Active		7.28
Red-tailed Hawk	88	699829	4066095	Cliff	Active		7.31
Common Raven	89	699569	4066533	Cliff	Inactive		7.35
Common Raven	173	687269	4070933	Cliff	Active		7.39
Red-tailed Hawk	158	705621	4044871	Cliff	Active		7.41
Red-tailed Hawk	85	698653	4067936	Cliff	Active		7.54
Common Raven	154	705645	4044580	Cliff	Active		7.55
Golden Eagle	86	698641	4068022	Cliff	Active		7.57
Prairie Falcon	171	686705	4071232	Cliff	Active		7.63
Common Raven	172	686705	4071239	Eucalyptus	Active		7.64
Common Raven	64	708344	4057912	Power Tower	Inactive		7.66
Golden Eagle	170	686600	4071318	Cliff	Active		7.7
Common Raven	65	707206	4060337	Power Tower	Inactive		7.76
Common Raven	66	706855	4061014	Power Tower	Inactive		7.83
Common Raven	90	700796	4066261	Cliff	Inactive		7.86
Prairie Falcon	91	700750	4066331	Cliff	Inactive		7.86
Red-tailed Hawk	92	700723	4066361	Cliff	Active		7.86
Common Raven	146	709599	4054229	Cliff	Inactive		7.89
Common Raven	67	706624	4061486	Power Tower	Inactive		7.9
Common Raven	68	706182	4062259	Power Tower	Inactive		7.99
Common Raven	145	709785	4053854	Cliff	Inactive		7.99
Common Raven	147	709752	4054497	Cliff	Inactive		8
Common Raven	69	705960	4062667	Power Tower	Inactive		8.06
Common Raven	70	705759	4063048	Power Tower	Active		8.13
Common Raven	71	705552	4063404	Power Tower	Active		8.2
Common Raven	72	705321	4063807	Power Tower	Inactive		8.29
Common Raven	73	705199	4064163	Power Tower	Inactive		8.4
Common Raven	74	705013	4064639	Power Tower	Inactive		8.55
Common Raven	155	706504	4042952	Cliff	Active		8.65
Common Raven	135	710786	4055198	Power Tower	Inactive		8.69
Common Raven	75	704848	4065093	Power Tower	Active		8.7

Species	Point	Easting	Northing	Substrate	Status	Notes	Distance From Site
Common Raven	174	685981	4072937	Cliff	Active		8.76
Common Raven	136	711213	4054523	Power Tower	Inactive		8.91
Golden Eagle	175	685953	4073276	Cliff	Active	Fledged young in 2010	8.97
Common Raven	137	711378	4054258	Power Tower	Active		9
Red-tailed Hawk	27	711189	4056753	Power Tower	Active		9.12
Common Raven	76	703932	4066820	Power Tower	Inactive		9.23
Common Raven	84	700505	4070153	Power Tower	Active		9.33
Common Raven	62	699788	4070833	Power Tower	Inactive		9.36
Common Raven	63	700231	4070475	Power Tower	Active		9.37
Common Raven	138	712028	4053286	Power Tower	Inactive		9.38
Common Raven	83	701045	4069744	Power Tower	Active		9.38
Common Raven	60	698885	4071592	Power Tower	Inactive		9.41
Common Raven	61	699232	4071335	Power Tower	Inactive		9.41
Common Raven	186	675911	4067213	Cliff	Inactive		9.43
Common Raven	82	701698	4069225	Power Tower	Active		9.45
Common Raven	77	703429	4067556	Power Tower	Inactive		9.46
Common Raven	81	702065	4068941	Power Tower	Inactive		9.5
Common Raven	59	697778	4072457	Power Tower	Inactive		9.51
Common Raven	139	712236	4052980	Power Tower	Active		9.51
Common Raven	58	697525	4072656	Power Tower	Inactive		9.55
Common Raven	78	703253	4067841	Power Tower	Inactive		9.56
Common Raven	156	706127	4040723	Cliff	Inactive	Built on an old eagle nest	9.56
Prairie Falcon	157	706102	4040702	Cliff	Active		9.56
Common Raven	80	702439	4068647	Power Tower	Inactive		9.57
Common Raven	140	712384	4052740	Power Tower	Inactive		9.6
Common Raven	57	697223	4072914	Cliff	Active		9.61
Red-tailed Hawk	79	702787	4068386	Power Tower	Active		9.64
Common Raven	195	686725	4038865	Cliff	Inactive		9.72
Common Raven	141	712936	4052059	Power Tower	Active		9.96
Golden Eagle	194	686565	4038457	Cliff	Inactive	Historic nest site	9.98
Common Raven	193	686649	4038178	Cliff	Inactive		10.15
Common Raven	142	713867	4051092	Power Tower	Inactive		10.59
Common Raven	143	714018	4050918	Power Tower	Active		10.7
Common Raven	144	714404	4050508	Power Tower	Active		10.97
Red-tailed Hawk	134	710636	4036047	Cliff	Inactive		13.58
Common Raven	133	711135	4036423	Cliff	Inactive		13.59
Prairie Falcon	132	711910	4033670	Cliff	Active		15.23
Turkey Vulture	131	713083	4033127	Cliff	Active		15.94



LEGEND

Raptors

- Barn Owl
- Great Horned Owl
- Golden Eagle
- Prairie Falcon
- Red-tailed Hawk
- Turkey Vulture

Aerial photo courtesy of Digital Globe

Live Oak Associates, Inc.

PVSF
Raptor Survey

Date	Project #	Figure #
9/20/2010	1297-11	

Panoche Valley Solar Facility

2014 Final Golden Eagle Nesting Survey Report

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ABOUT BLOOM BIOLOGICAL, INC.

For more than 35 years, Bloom Biological, Inc. (BBI) has provided biological consulting services for large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment, permitting, conservation planning and geospatial analysis. Our innovative approach has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as a number of other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in California and the western United States, BBI biologists have worked in Alaska, Central and South America, Europe, Southern Asia, and the western Pacific. BBI is a certified Small Business Enterprise.

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1.0 INTRODUCTION

Bloom Biological, Inc. (BBI) was retained by Duke Energy for Panoche Valley Solar, LLC (the Applicants) to conduct nesting surveys for Golden Eagle (*Aquila chrysateos*) associated with the Panoche Valley Solar Facility (Project), an approximately 399 megawatt solar photovoltaic energy generating facility proposed for construction in San Benito County, California. BBI previously conducted surveys for the proposed Project, documenting 15 potential Golden Eagle nests within ten miles of the proposed Project, 8 of which were designated as having been active in the 2010 breeding season (BBI 2010). The report authors noted however, that the survey was conducted late in the season and that a more complete survey should be conducted during the breeding season and prior to leaf-on of deciduous trees, when nests would be easier to detect. To augment the 2010 nest survey effort, the U.S. Fish and Wildlife Service (Service) recommended that the Applicants conduct "Stage 2" aerial surveys of the Project area nesting population during a January-February time frame before leaf-on. BBI conducted aerial surveys for Golden Eagle with ten miles of the proposed project in January and April 2014, resulting in the documentation of 46 Golden Eagle nests and an estimated 30 Golden Eagle territories, with nine of them active, though none were located within three miles of the limits of the proposed Project. This report presents BBI's detailed survey methods and results, identifying the location and status of all nests, and the distance from each nest to the Project.

2.0 NATURAL HISTORY

The Golden Eagle is found throughout most of the north Temperate Zone. In North America it ranges from arctic Canada and Alaska south through the western United States to central Mexico. Northern populations are migratory; however, most populations south of Canada are residents or short-distant migrants.

Kochert et al. (2002) provided a thorough description of the natural history of the Golden Eagle, noting that the species is found in a variety of habitats located in a wide range of latitudes throughout the Northern Hemisphere. In North America, Golden Eagles are most common in the western half of the continent near open spaces that provide habitat for foraging, and generally with cliffs present for nesting sites. While northern populations of the species are migratory, often making trips of thousands of miles to the wintering grounds; southern populations (including those in southern California) tend to be resident year-round.

While Golden Eagles are capable of killing large prey such as cranes, wild ungulates, and domestic livestock, they primarily subsist on rabbits, hares, ground squirrels, and prairie dogs (Bloom and Hawks 1982, Olendorff 1976). Golden Eagles are thought to typically reach sexual maturity, form territories and begin nesting at four years of age. Pairs are generally thought to stay within the limits of their territory, which can measure well over 20 square kilometers and may contain as many as 14 nests (Kochert et al. 2012, Bloom pers. obs.). The pair maintains and repairs one or more of these nests as part of its courtship. Over the course of a decade several of these nests will be used and will produce young, while others may only receive occasional fresh sticks. Most alternate nests are important in the successful reproduction of a pair of eagles. Kochert et al. (2002) also noted that the nesting season is prolonged, extending more than 6 months from the time the 1-3 eggs are laid until the young reach independence. A typical Golden Eagle raises an average of only 1 young per year and up to 15 young over its lifetime. Pairs commonly refrain from laying eggs in some years, particularly when prey is scarce. The number of young that Golden Eagles produce each year depends on a combination of weather and prey conditions.

3.0 REGULATORY STATUS

Regulatory protections for Golden Eagles include thorough surveys to determine the status of Golden Eagles for projects occurring within their range and habitat. The intent is to determine the extent of potential direct, indirect and cumulative effects projects may have on eagles, avoid and or minimize these effects, assess the potential for incidental take during project operation, and monitor eagle populations. These measures are predominantly driven by the Bald and Golden Eagle Protection Act.

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

For purposes of the guidelines, "disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

4.0 STUDY AREA DESCRIPTION

The Study Area includes all areas inside of, and within a 10-mile (16-kilometer) radius of the Project boundary (Figure 1, Exhibit 1), and encompasses approximately 305,004 acres (123,431 hectares). The Study Area is southeast of the City of Los Banos, California, and portions lie within San Benito, Fresno, and Merced Counties.

Terrain is variable throughout the Study Area, and includes relatively flat, largely agricultural fields in the extreme east, bordered by rolling arid grasslands that occupy the central portion. Most of the western half of the Study Area lies within the Diablo Range and includes more rugged hills and mountains with rocky outcroppings and cliff faces. The predominant land-use within the Study Area is ranching. Vegetative cover includes grasslands and agriculture in the east, chaparral at low elevations in the mountains, with Gray Pine (*Pinus sabineana*) occurring at higher elevations in the mountains, and various oak species, including the deciduous Blue Oak (*Quercus douglasii*), and evergreen Valley Oak (*Quercus lobata*) and Canyon Live Oak (*Quercus chrysolepis*). Elevation within the Study Area ranges from approximately 600 feet above mean sea level (amsl) in the southeast to approximately 4,000 feet amsl in the west.

Figure 1. Study area location

5.0 METHODS

As per guidance provided by the Service, an initial round of helicopter surveys was performed over a 10-day period during the early breeding season, from January 15-24, 2014. A second round of surveys was conducted over a 7-day period from April 2-8, 2014, when active nests were expected to contain eggs or young nestlings. The first round of surveys was conducted early enough that deciduous trees such as California Sycamore (*Platanus racemosa*), Valley Oak and particularly Blue Oak, which were very abundant in parts of the study area, had not yet leafed out, making it easier to detect large nests within their canopies.

All surveys were conducted by BBI biologist Peter H. Bloom, Ph.D. (lead observer), who was accompanied by one of three assistant observers, including Scott Thomas, Karyn Sernka and Michael J. Kuehn, Ph.D. The helicopter (Bell Jet Ranger 206) was owned and operated by a pilot experienced in conducting aerial Golden Eagle nesting surveys. Survey methodology described in Section VII.b of Aerial Surveys of Pagel et al. (2010) was followed to the extent possible. The biologists conducted an aerial examination of all appropriate nesting habitat inside the pre-defined Study Area described above (Section 4.0). During aerial surveys, BBI biologists searched for large stick nests of Golden Eagles and other raptors on cliff faces, rocky outcrops, trees, transmission towers, and other suitable nesting substrates.

GPS units (one primary and one backup) were used to mark locations of nest sites. The following information was recorded for each raptor or Common Raven (*Corvus corax*) nest found during surveys:

- Name of observer(s)
- Date/Time/Weather conditions
- Species of nest owner
- Location (GPS coordinates)
- Nest status (active, inactive, or unknown)
- Nest contents (empty, eggs, nestlings)
- Nest condition
- Nest substrate
- Nest description (or other indications of breeding behavior)
- Other pertinent descriptive information

Photographs were taken of Golden Eagle nests when feasible, and are presented in Appendix A of this report. Survey dates, times, and weather conditions are summarized in Table 1.

Table 1. Field Survey Dates, Times, and Weather Conditions

Date	Time	Weather	Biologists
1/15/2014	1300-1545h	Start: 62°F, 0% Cloud Cover, Breeze out of the SW End: 56°F, 0% Cloud Cover, Breeze out of the SW No Rain, No Fog, No Snow	Peter Bloom Scott Thomas
1/16/2014	0830-1700h	Start: 45°F, 0% Cloud Cover, Calm out of the SW End: 63°F, 0% Cloud Cover, Breeze out of the SW No Rain, No Fog, No Snow	Peter Bloom Scott Thomas
1/17/2014	0800-1630h	Start: 38°F, 0% Cloud Cover, Calm out of the N End: 58°F, 0% Cloud Cover, Light Wind out of the NW No Rain, No Fog, No Snow	Peter Bloom Karyn Sernka
1/18/2014	0830-1645h	Start: 41°F, 0% Cloud Cover, Calm out of the N End: 62°F, 0% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Karyn Sernka
1/19/2014	0830-1645h	Start: 40°F, 0% Cloud Cover, Light Wind out of the NE End: 65°F, 0% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Karyn Sernka

Date	Time	Weather	Biologists
1/20/2014	0800-1630h	Start: 39°F, 0% Cloud Cover, Calm out of the N End: 61°F, 0% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Karyn Sernka
1/21/2014	0800-1645h	Start: 38°F, 50% Cloud Cover, Light Wind out of the NW End: 60°F, 0% Cloud Cover, Light Wind out of the NE No Rain, No Fog, No Snow	Peter Bloom Karyn Sernka
1/22/2014	0840-1700h	Start: 41°F, 0% Cloud Cover, Calm out of the N End: 63°F, 0% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
1/23/2014	0900-1700h	Start: 46°F, 0% Cloud Cover, Calm out of the N End: 64°F, 0% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
1/24/2014	0850-1200h	Start: 51°F, 40% Cloud Cover, Calm out of the N End: 60°F, 100% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/2/2014	1200-1800h	Start: 62°F, 50% Cloud Cover, Light Wind out of the NE End: 60°F, 40% Cloud Cover, Light Wind out of the NE No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/3/2014	0730-1715h	Start: 43°F, 0% Cloud Cover, Calm out of the N End: 58°F, 0% Cloud Cover, Light Wind out of the NW No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/4/2014	0745-1730h	Start: 50°F, 0% Cloud Cover, Calm out of the N End: 58°F, 0% Cloud Cover, Breeze out of the W No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/5/2014	0730-1730h	Start: 48°F, 0% Cloud Cover, Breeze out of the W End: 67°F, 0% Cloud Cover, Light Wind out of the NW No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/6/2014	0730-1715h	Start: 46°F, 30% Cloud Cover, Calm out of the N End: 71°F, 20% Cloud Cover, Light Wind out of the N No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/7/2014	0715-1730h	Start: 51°F, 20% Cloud Cover, Calm out of the N End: 78°F, 0% Cloud Cover, Breeze out of the NW No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn
4/8/2014	0700-1245h	Start: 54°F, 10% Cloud Cover, Calm out of the N End: 81°F, 30% Cloud Cover, Calm out of the N No Rain, No Fog, No Snow	Peter Bloom Michael Kuehn

5.1 Nest Determination

5.1.1 Species Identification

Biologists determined the species that built or occupied all large stick nests discovered during surveys by observing defending or incubating adults, the size of the nest, stick size, eggs and chicks, volume and height of excrement, and anthropogenic material if present. These distinctions were based upon the experience of the principal investigator (Dr. Bloom), which includes the entry and inspection of thousands of California raptor nests of 22 raptorial species including Golden Eagle, and the four raptor species that might utilize Golden Eagle nests in this region; Red-tailed Hawk (*Buteo jamaicensis*), Peregrine Falcon (*Falco peregrinus*), Prairie Falcon (*Falco mexicanus*) and Great Horned Owl (*Bubo virginianus*).

Within the Study Area, the Red-tailed Hawk is the predominant raptor species that builds large nests constructed of sticks, which may overlap in size with Golden Eagle nests. Common Ravens are non-raptors

that also construct reasonably large stick nests in this region. Of these three species, Red-tailed Hawk and Common Raven nests are the most abundant by a large factor. Fortunately, there are often predictable cues that can be used to differentiate among the nests of these species, beyond the direct observation of adults, young or eggs in the nest.

Common Ravens tend to have the smallest nests of the three species, followed by Red-tailed Hawks and finally, Golden Eagles, which may build nests 15 feet tall and 6 feet wide.

Though Red-tailed Hawk and Common Raven nests are sometimes difficult to distinguish from one another, Common Ravens are unique in that they often bring trash to their nest sites situated near civilization, and their nests tend to be very tightly structured. However, many Common Raven nests, and particularly those in very remote locations, do not incorporate anthropogenic materials into their nests.

Golden Eagle and Red-tailed Hawk nests can also be difficult to separate from each other without ample experience. The two species often use each other's nests for reproduction, though Red-tailed Hawks more commonly usurp Golden Eagle nests than the other way around. This may be because Golden Eagles often have more alternate nests than do Red-tailed Hawks and because the larger Golden Eagle nests tend to survive longer. Newly created, first year Golden Eagle nests are typically 6-10 inches thick and as small as 4 feet wide and may overlap in size with Red-tailed Hawk nests. At the other end of the size spectrum, Golden Eagles may build large tower nests that exceed 15 feet in thickness and 4-6 feet in width.

We considered nests greater than 5 feet wide and 3 feet thick to be definitive eagle nests. The size of the sticks, both in diameter and length also provides clues as to what species carried them and added them to the nest, with eagle nests containing much larger sticks than Red-tailed Hawks would generally bring to their nests.

5.1.2 Nest Status

A nest was considered *active* if any of the following three conditions was met: (1) fresh (live or dead) sticks had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Nests without any of these signs were considered *inactive*. A *failed* nest was an active nest that did not successfully fledge young. The newness (fresh sticks) of nest sticks can often be determined by their color and condition if they were recently collected from live plants and trees, however bleaching by the desert sun can sometimes make new sticks appear old quickly. The placement, compaction or lack of compaction of sticks can be a more accurate determination of the newness, such as the fresh sticks seen on the top of a recently active Golden Eagle nest compared with the compacted old sticks in the inactive nest. A *successful* nest was one that fledged at least one young (typically assumed if young were greater than eight weeks old during an observation). Active nests found at the end of the nesting cycle with considerable excrement in and around the nest, surrounding boulders or alternate nests were considered to have fledged.

Determining the activity status of nests during the breeding season is often unequivocal because in some instances there will be an adult eagle incubating eggs or brooding nestlings and/or visible eggs or nestlings. However, nest status can often be inferred even if a nest is visited outside of the actual nesting period (e.g., prior to egg laying or after fledging). Under these circumstances, more emphasis is placed on the condition of the nest and presence or absence of sign. Prior to egg laying, a typical active Golden Eagle nest will be relatively level on top, will have visibly newer sticks several inches thick arranged on the top of the nest, may have fresh greenery, and may have fresh feathers. Following fledging, the biologists primarily consider the condition of the nest and the amount (or lack of) and relative age of white-wash, which in the case of Golden Eagles should occur in significant amounts forming a broad splatter pattern composed of long, large broken streaks often referred to as slices. At some locations with recently fledged multiple young, it may appear as if it snowed below the nest edge.

Although there may be no definitive determination of whether nestling(s) fledged there will be strong indicators if the nest was active and at least contained chicks of more than a few weeks old. White wash sprays and slices behind the nest are not commonly deposited by adults. Significant accumulation of fresh white wash behind, around, directly below, and approximately level with the nest are indicators that nestling(s) were present.

Other factors considered include the nearby presence or absence of adult and/or fledgling eagles, active nearby perch sites with fresh sign and active alternative nests within close proximity to the nest in question.

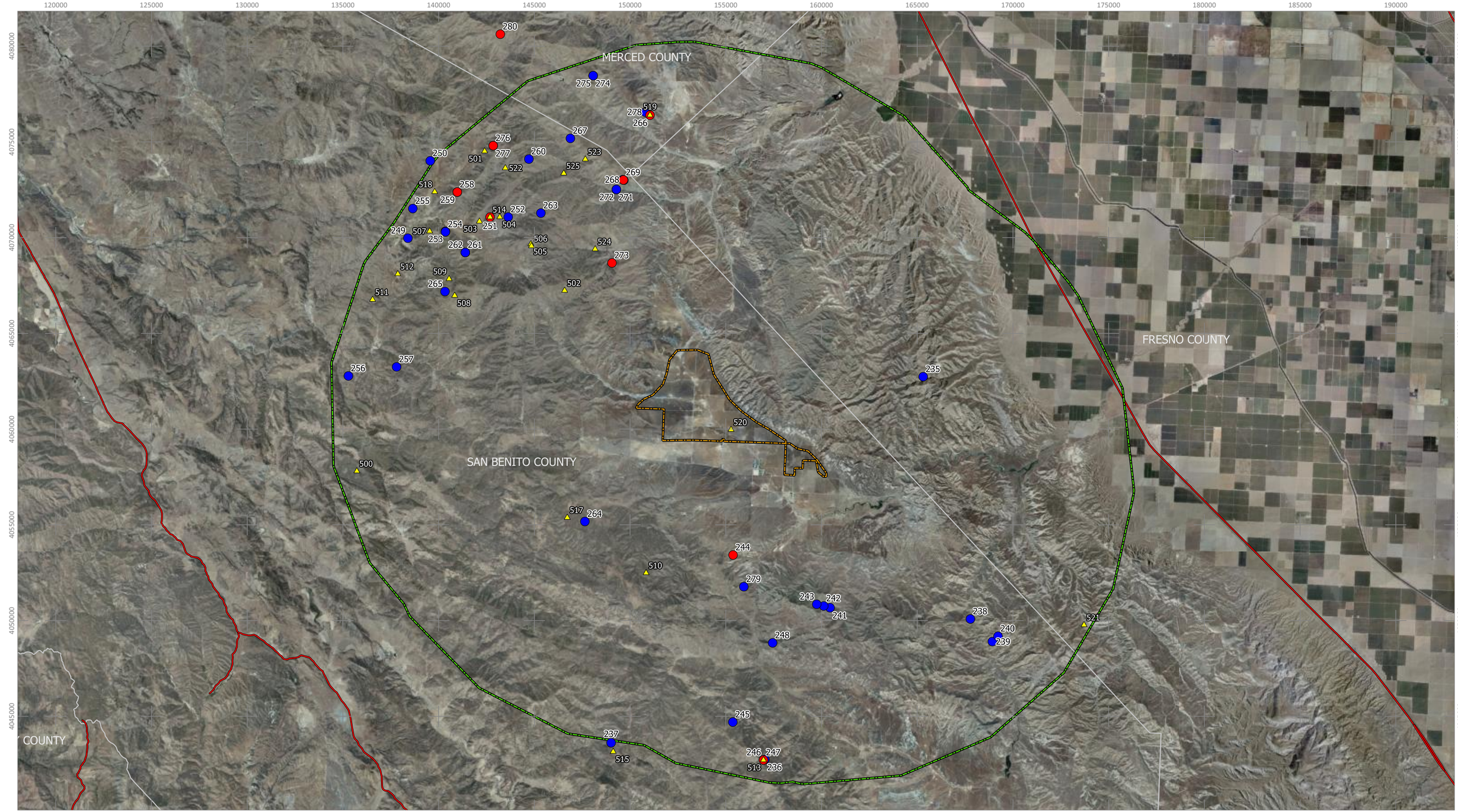
6.0 RESULTS & DISCUSSION

A total of 492 nests was documented by BBI within the Study Area, including 46 Golden Eagle nests. All Golden Eagle nests are listed in Table 2 below, and their locations are mapped in Exhibit 1. Photographs of all Golden Eagle nests that could safely be photographed are presented in Appendix A. All nests classified as belonging to species other than Golden Eagles are listed in Appendix B, including nests of 226 Common Ravens, 146 Red-tailed Hawks, 62 Prairie Falcons, 8 Barn Owls (*Tyto alba)*, 3 Great Horned Owls, and 1 Turkey Vulture (*Cathartes aura*).

Dr. Bloom estimates that the 46 Golden Eagle nests discovered during this survey effort comprise approximately 30 breeding territories, some of which contain one or more alternate nests. The actual number of territories could be slightly higher or lower than 30, and the exact number of territories depends, in part, on how alternate nests of a single territory are defined. In most cases, nests that were on the same cliff faces, or at least very close together could be safely designated as alternate nests within the same breeding territory. For example, nest IDs 266 and 278 were separated by less than 330 yards (300 meters) and were in the same watershed, and were attributed to the same breeding territory. In other cases, it was less clear if different nests were part of a single territory or not. Golden Eagle nesting density (and territory size) is driven primarily by habitat quality, with higher nesting density in better quality habitat. Given that habitat quality in the Study Area varies from quite high (in the northwestern quadrant, where most nests were located), to quite low, in extreme eastern portions, it would not be surprising for nests in some areas to be located as close together as 1 mile (1.6 kilometers), or even rarely 0.5 miles (0.8 kilometers), particularly in the areas of better quality habitat. Golden Eagle nests 251 and 252, in the northwestern quadrant, were separated by only 0.6 miles (1 kilometer), and this is a prime example of two nests that could comprise two breeding territories, but likely represent one.

In total, nine Golden Eagle nests were classified as active in the 2014 season, each representing a separate territory. Thus, active nesting occurred in almost one-third (9 of about 30) of the territories identified in this survey. Of these nine nests, eggs are presumed to have been laid in at least four. Adults were observed on nests in incubating posture, in April, at nest IDs 246 and 251, and two un-incubated eggs were observed in (presumed failed) nest ID 276 in April. Finally, two chicks were observed being tended to by a female Golden Eagle at nest ID 266 in early April. Of the remaining five Golden Eagle nests that were identified as active in 2014, none was known to contain eggs or nestlings as of April 8th. Given that Golden Eagles in this region normally lay eggs on or before this date, it is very unlikely that any of these nests went on to successfully fledge young during the 2014 nesting season.

No Golden Eagle nests were identified within 3 miles (5 kilometers) of the Project (Table 2), though four nests (IDs 244, 264, 273 and 279), comprising four breeding territories were located within four miles of the Project boundary. Two of these four nests (IDs 244 and 273) were active in 2014, though neither nest was ever found to contain eggs or nestlings. The next closest active Golden Eagle nest to the Project in 2014 was nest ID 269, located 5.79 miles (9.34 kilometers) north-northwest of the Project.



County Border
Major Road
Proposed Project Boundary
Study Area

Observation Type

- Active Golden Eagle Nest
- Inactive Golden Eagle Nest
- Golden Eagle Observation

10000 0 10000 20000 30000 40000 ft

1:184,877

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 5/10/2014
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 1. 2014 Golden Eagle Nesting Survey Results

Panoche Valley Solar Project | Merced, Fresno and San Benito Counties, California

BBI

Although it cannot be ruled out that some Golden Eagle nests within the Study Area could have gone undetected, the 10-day effort in late January represented a massive and comprehensive survey, during a period when deciduous trees such as Blue and Valley Oaks had not yet leafed out. This effort was followed by an 8-day effort in April, when special attention was paid to surveying areas where adult Golden Eagles had been observed, but no nests had been found; or where only inactive nests had been found and additional effort was dedicated to surveying for active nests that may have been missed.

Table 2. Golden Eagle Nests Discovered During Surveys

The following table lists the identification number (ID) of all 46 Golden Eagle nests discovered during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) substrate supporting nest (Substrate), (2) estimated nest height in feet (Est. Height [ft.], (3) nest contents (Contents), (4) quantity of nest contents (Quan.), (5) nest status (Status), (6) distance in miles from nest to the proposed Project (Project Dist. [mi.]), and (7) relevant notes (Notes).

ID	Substrate	Est. Height (ft.)	Contents	Quan.	Status	Project Dist. (mi.)	Notes
235	Cliff	50	Empty	0	Inactive	4.37	
236	Cliff	50	Empty	0	Inactive	9.24	Fledged young in 2013
237	Cliff	50	Empty	0	Inactive	9.93	
238	Cliff	150	Empty	0	Inactive	6.56	
239	Cliff	85	Empty	0	Inactive	7.58	Two nests on east face, one nest on west face
240	Cliff	85	Empty	0	Inactive	7.59	
241	Cliff	75	Empty	0	Inactive	4.25	Very old
242	Cliff	100	Empty	0	Inactive	4.19	Fledged young in 2013
243	Cliff	60	Empty	0	Inactive	4.14	Sticks below nest
244	Cliff	70	Empty	0	Active	3.09	Nest freshly rebuilt in January, but unattended, empty, and looked worn and inactive in April
245	Cliff	50	Empty	0	Inactive	8.18	On same cliff face as two inactive Common Raven nests
246	Cliff	50	Unknown	N.A.	Active	9.26	Nest with fresh greenery on Jan. 21. adult sitting tight, presumably on eggs, on nest on Apr. 2
247	Cliff	50	Empty	0	Inactive	9.26	Old nests near active Golden Eagle nest
248	Gray Pine	50	Empty	0	Inactive	5.46	
249	Valley Oak	80	Empty	0	Inactive	9.20	
250	Valley Oak	60	Empty	0	Inactive	10.07	Nest on mistletoe
251	Blue Oak	55	Unknown	N.A.	Active	7.42	Active and empty on Jan. 19. Adult sitting on nest in incubation posture Apr. 3.
252	Blue Oak	65	Empty	0	Inactive	6.97	Falling, only remnants remain in tree. Some whitewash. Not photographed
253	Blue Oak	70	Empty	0	Inactive	8.36	Near another nest in tree with bare branches
254	Blue Oak	70	Empty	0	Inactive	8.35	near another nest in tree with live (leaved) branches

ID	Substrate	Est. Height (ft.)	Contents	Quan.	Status	Project Dist. (mi.)	Notes
255	Valley Oak	70	Empty	0	Inactive	9.65	
256	Gray Pine	65	Empty	0	Inactive	9.38	Smaller nest above main nest in same tree
257	Gray Pine	55	Empty	0	Inactive	7.87	
258	Blue Oak	60	Empty	0	Active	8.76	Adults present near nest on Jan. 19 and Apr. 3, fresh greenery in bowl. Eggs never observed. Second, inactive nest 50 meters away.
259	Blue Oak	60	Empty	0	Inactive	8.76	50 meters from second, active Golden Eagle nest
260	Blue Oak	55	Empty	0	Inactive	7.84	
261	Blue Oak	55	Empty	0	Inactive	7.45	Two nests in same tree. Lower nest is smaller, older. Pair of adult Golden Eagles near
262	Blue Oak	60	Empty	0	Inactive	7.45	Two nests in same tree. Higher nest is larger, newer. Pair of adult Golden Eagles near
263	Blue Oak	65	Empty	0	Inactive	6.27	Very large nest; two adults and one 2nd-year bird nearby
264	Gray Pine	60	Empty	0	Inactive	3.64	
265	Blue Oak	55	Empty	0	Inactive	7.24	Yellow-billed Magpie nest in top of tree
266	Cliff	100	Nestlings	2	Active	7.67	Nest inactive on Jan. 15. An adult and 2 nestlings in nest on Apr. 4
267	Cliff	50	Empty	0	Inactive	7.69	
268	Cliff	150	Empty	0	Inactive	5.80	
269	Cliff	80	Empty	0	Active	5.79	Built on this season.
270	Cliff	50	Empty	0	Inactive	5.78	Used recently in a previous season
271	Cliff	60	Empty	0	Inactive	5.57	Old nest located above Red-tailed Hawk nest
272	Cliff	35	Empty	0	Inactive	5.57	Very old, located below and west of another old eagle nest
273	Cliff	50	Empty	0	Active	3.53	Two nests next to each other on same rock face; Inactive on Jan. 20, but significantly built on by Apr. 4. No eggs ever observed.
274	Cliff	50	Empty	0	Inactive	9.30	On west face
275	Cliff	60	Empty	0	Inactive	9.30	On east face
276	Blue Oak	40	Eggs	2	Active	8.91	Lower of two nests in same tree. Adult near on Jan. 23, but nest inactive. On Apr. 3, contained two un-incubated eggs, though two adult eagles were nearby. Eggs still not being incubated on Apr. 4.
277	Blue Oak	45	Empty	0	Inactive	8.91	Upper of two nests in same tree.
278	Cliff	70	Empty	0	Inactive	7.79	Inactive. More than 100 yards of ribbon with colored flagging strewn across vegetation above cliff with nest

ID	Substrate	Est. Height (ft.)	Contents	Quan.	Status	Project Dist. (mi.)	Notes
279	Cliff	60	Empty	0	Inactive	3.85	Good condition but no whitewash. Not active in last 5 years
280	Cliff	55	Empty	0	Active	11.73	Newly built nest this year.

Table 3. Golden Eagle and California Condor Observations Made During Surveys

The following table lists the identification number (ID) of all Golden Eagle and California Condor observations made during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) common name of species observed (Species), (2) number of individuals observed (Quan.), (3) age of individuals observed (Age), (4) sex of individuals observed (Sex), and (5) relevant notes (Notes).

ID	Species	Quan.	Age	Sex	Notes
500	Golden Eagle	1	Adult	Unknown	
501	Golden Eagle	1	Adult	Unknown	
502	Golden Eagle	2	Adult	Pair	
503	Golden Eagle	1	Adult	Unknown	
504	Golden Eagle	1	Adult	Unknown	
505	Golden Eagle	1	Subadult	Unknown	2nd year bird
506	Golden Eagle	2	Adult	Pair	Not aggressive toward 2nd year bird in area
507	Golden Eagle	1	Unknown	Unknown	Perched
508	Golden Eagle	2	Adult	Pair	Perched at top of ridge
509	Golden Eagle	1	Adult	Unknown	Perched
510	Golden Eagle	1	Unknown	Unknown	Soaring over peak
511	Golden Eagle	4	Mixed	Mixed	One group of three Golden Eagles (two adults, one subadult) and a fourth, lone adult in the distance
512	Golden Eagle	2	Adult	Pair	
513	Golden Eagle	1	Adult	Unknown	Adult on nest in incubation posture
514	Golden Eagle	1	Adult	Female	Adult on nest in incubation posture
515	Golden Eagle	1	Adult	Unknown	In flight
516	California Condor	2	Adult	Pair	Emerged from crevice in cliff
517	Golden Eagle	1	Adult	Unknown	Flying to south
518	Golden Eagle	1	Adult	Female	Flying over field
519	Golden Eagle	1	Adult	Female	Adult on nest in incubation posture
520	Golden Eagle	1	Adult	Unknown	Flying about 600 feet above ground
521	Golden Eagle	1	Adult	Unknown	In flight
522	Golden Eagle	1	Adult	Unknown	
523	Golden Eagle	1	Subadult	Unknown	
524	Golden Eagle	1	Adult	Unknown	Flying. One of two adults detected in territory
525	Golden Eagle	1	Adult	Female	Perched. One of two adults detected in territory

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APPENDIX A. PHOTOGRAPHS OF GOLDEN EAGLE NESTS

Nest ID 235

Nest ID 237

Nest ID 238

Nest ID 239

Nest ID 240

Nest ID 241

Nest ID 242

Nest ID 243

Nest ID 244

Nest ID 245

Nest ID 246

Nest ID 247

Nest ID 248

Nest ID 249

Nest ID 251

Nest ID 253

Nest ID 254

Nest ID 255

Nest ID 256

Nest ID 257

Nest ID 258

Nest ID 259

Nest ID 260

Nest ID 262

Nest ID 263

Nest ID 264

Nest ID 265

Nest ID 266

Nest ID 267

Nest ID 268

Nest ID 269

Nest ID 270

Nest ID 271

Nest ID 272

Nest ID 273

Nest ID 274

Nest ID 275

Nest ID 276

Nest ID 277

Nest ID 278

Nest ID 279

Nest ID 280

APPENDIX B. NON-GOLDEN EAGLE SURVEY RESULTS

The following table lists the identification number (ID) of all non-Golden Eagle nests discovered during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) species of nest-owner (Species), (2) substrate supporting nest (Substrate), (3) nest contents (Contents), (4) quantity of nest contents (Quan.), (5) nest status (Status), (6) distance in miles from nest to the proposed Project (Project Dist. [mi.]), and (7) relevant notes (Notes).

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
1	Barn Owl	Cliff	Empty	0	Inactive	8.56	Possible Prairie Falcon eyrie
2	Barn Owl	Cliff	Empty	0	Inactive	8.45	Possible Prairie Falcon eyrie
3	Barn Owl	Cliff	Empty	0	Inactive	8.27	Possible Prairie Falcon eyrie
4	Barn Owl	Cliff	Empty	0	Inactive	1.31	
5	Barn Owl	Cliff	Empty	0	Inactive	1.73	
6	Barn Owl	Cliff	Empty	0	Inactive	1.94	
7	Barn Owl	Cliff	Empty	0	Inactive	2.16	
8	Barn Owl	Cliff	Empty	0	Inactive	2.85	
9	Common Raven	Cliff	Empty	0	Inactive	7.96	Fallen nest
10	Common Raven	Cliff	Empty	0	Inactive	8.18	
11	Common Raven	Windmill	Empty	0	Inactive	5.71	
12	Common Raven	Cliff	Empty	0	Inactive	5.12	
13	Common Raven	Cliff	Empty	0	Inactive	5.06	
14	Common Raven	Cliff	Empty	0	Inactive	9.33	
15	Common Raven	Cliff	Empty	0	Inactive	7.99	
16	Common Raven	Cliff	Empty	0	Inactive	5.64	
17	Common Raven	Cliff	Empty	0	Inactive	7.28	
18	Common Raven	Cliff	Empty	0	Inactive	7.31	
19	Common Raven	Cliff	Empty	0	Inactive	8.22	
20	Common Raven	Cliff	Empty	0	Inactive	8.49	
21	Common Raven	Cliff	Empty	0	Inactive	6.05	
22	Common Raven	Rock	Empty	0	Inactive	7.04	
23	Common Raven	Cliff	Empty	0	Inactive	4.47	
24	Common Raven	Cliff	Empty	0	Inactive	4.88	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
25	Common Raven	Cliff	Empty	0	Inactive	9.57	
26	Common Raven	Cliff	Empty	0	Inactive	10.52	
27	Common Raven	Cliff	Empty	0	Inactive	10.53	Three Common Raven nests, same cliff
28	Common Raven	Cliff	Empty	0	Inactive	11.22	
29	Common Raven	Cliff	Empty	0	Inactive	10.23	
30	Common Raven	Cliff	Empty	0	Inactive	10.30	
31	Common Raven	Cliff	Empty	0	Inactive	9.50	
32	Common Raven	Cliff	Empty	0	Inactive	6.86	
33	Common Raven	Cliff	Empty	0	Inactive	5.89	
34	Common Raven	Cliff	Empty	0	Inactive	5.77	
35	Common Raven	Cliff	Empty	0	Inactive	6.35	
36	Common Raven	Cliff	Empty	0	Inactive	6.53	
37	Common Raven	Cliff	Empty	0	Inactive	6.57	
38	Common Raven	Cliff	Empty	0	Inactive	6.71	
39	Common Raven	Cliff	Empty	0	Inactive	7.37	
40	Common Raven	Cliff	Empty	0	Inactive	6.33	
41	Common Raven	Cliff	Empty	0	Inactive	4.55	
42	Common Raven	Cliff	Empty	0	Inactive	4.60	
43	Common Raven	Cliff	Empty	0	Inactive	4.10	
44	Common Raven	Cliff	Empty	0	Inactive	6.13	
45	Common Raven	Cliff	Empty	0	Inactive	5.99	
46	Common Raven	Cliff	Empty	0	Inactive	7.14	
47	Common Raven	Cliff	Empty	0	Inactive	9.49	
48	Common Raven	Cliff	Empty	0	Inactive	10.11	
49	Common Raven	Cliff	Empty	0	Inactive	10.12	
50	Common Raven	Cliff	Empty	0	Inactive	7.29	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
51	Common Raven	Cliff	Empty	0	Inactive	6.17	
52	Common Raven	Cliff	Empty	0	Inactive	4.25	
53	Common Raven	Cliff	Empty	0	Inactive	4.82	
54	Common Raven	Cliff	Empty	0	Inactive	5.88	
55	Common Raven	Cliff	Empty	0	Inactive	4.56	
56	Common Raven	Cliff	Empty	0	Inactive	4.58	
57	Common Raven	Cliff	Empty	0	Inactive	4.22	
58	Common Raven	Cliff	Empty	0	Inactive	3.72	
59	Common Raven	Cliff	Empty	0	Inactive	4.36	
60	Common Raven	Cliff	Empty	0	Inactive	1.27	
61	Common Raven	Cliff	Empty	0	Inactive	2.77	
62	Common Raven	Cliff	Empty	0	Inactive	2.30	
63	Common Raven	Cliff	Empty	0	Inactive	10.22	
64	Common Raven	Cliff	Empty	0	Inactive	2.89	
65	Common Raven	Cliff	Empty	0	Inactive	3.14	
66	Common Raven	Cliff	Empty	0	Inactive	2.78	Near Red-tailed Hawk nest
67	Common Raven	Cliff	Empty	0	Inactive	0.64	
68	Common Raven	Cliff	Empty	0	Inactive	2.98	
69	Common Raven	Cliff	Empty	0	Active	2.09	
70	Common Raven	Cliff	Empty	0	Inactive	2.43	
71	Common Raven	Cliff	Empty	0	Inactive	2.41	
72	Common Raven	Cliff	Empty	0	Inactive	3.40	
73	Common Raven	Cliff	Empty	0	Active	3.32	
74	Common Raven	Cliff	Empty	0	Inactive	3.06	
75	Common Raven	Cliff	Empty	0	Inactive	3.62	
76	Common Raven	Cliff	Empty	0	Inactive	5.07	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
77	Common Raven	Cliff	Empty	0	Inactive	5.04	
78	Common Raven	Cliff	Empty	0	Inactive	5.07	
79	Common Raven	Cliff	Empty	0	Inactive	10.04	
80	Common Raven	Cliff	Empty	0	Inactive	9.97	
81	Common Raven	Cliff	Empty	0	Inactive	9.65	Two nests next to each other
82	Common Raven	Cliff	Empty	0	Inactive	9.65	
83	Common Raven	Cliff	Empty	0	Inactive	6.37	Two old nests nearby
84	Common Raven	Cliff	Empty	0	Active	4.22	
85	Common Raven	Cliff	Empty	0	Inactive	4.99	
86	Common Raven	Cliff	Empty	0	Inactive	3.90	
87	Common Raven	Cliff	Empty	0	Inactive	3.04	
88	Common Raven	Cliff	Empty	0	Inactive	3.03	
89	Common Raven	Cliff	Empty	0	Inactive	3.16	
90	Common Raven	Cliff	Empty	0	Inactive	2.85	
91	Common Raven	Valley Oak	Empty	0	Inactive	3.24	
92	Common Raven	Cliff	Empty	0	Inactive	2.56	
93	Common Raven	Cliff	Empty	0	Inactive	2.29	
94	Common Raven	Tower	Empty	0	Inactive	0.82	
95	Common Raven	Tower	Empty	0	Inactive	0.36	
96	Common Raven	Tower	Empty	0	Inactive	0.23	
97	Common Raven	Tower	Empty	0	Inactive	0.41	
98	Common Raven	Tower	Empty	0	Inactive	0.00	
99	Common Raven	Tower	Empty	0	Inactive	0.00	Nest in a transformer pole
100	Common Raven	Tower	Empty	0	Inactive	0.00	
101	Common Raven	Tower	Empty	0	Inactive	0.00	
102	Common Raven	Tower	Empty	0	Inactive	0.21	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
103	Common Raven	Tower	Empty	0	Inactive	0.55	
104	Common Raven	Tower	Empty	0	Inactive	0.87	
105	Common Raven	Tower	Empty	0	Inactive	1.01	
106	Common Raven	Tower	Empty	0	Inactive	5.49	
107	Common Raven	Tower	Empty	0	Inactive	5.70	Two nests on one tower
108	Common Raven	Tower	Empty	0	Inactive	9.96	
109	Common Raven	Valley Oak	Empty	0	Inactive	9.11	
110	Common Raven	Blue Oak	Empty	0	Inactive	9.13	
111	Common Raven	Digger Pine	Empty	0	Inactive	7.48	
112	Common Raven	Blue Oak	Empty	0	Inactive	0.66	
113	Common Raven	Blue Oak	Empty	0	Inactive	2.87	
114	Common Raven	Blue Oak	Empty	0	Inactive	2.95	
115	Common Raven	Cliff	Empty	0	Inactive	3.77	
116	Common Raven	Blue Oak	Empty	0	Inactive	5.29	
117	Common Raven	Cliff	Empty	0	Inactive	9.23	
118	Common Raven	Cliff	Empty	0	Inactive	9.17	
119	Common Raven	Tower	Empty	0	Inactive	10.07	
120	Common Raven	Tower	Empty	0	Inactive	10.03	
121	Common Raven	Tower	Empty	0	Inactive	9.99	Two nests in two adjacent towers
122	Common Raven	Tower	Empty	0	Inactive	9.92	
123	Common Raven	Tower	Empty	0	Inactive	9.88	Two nests in one tower
124	Common Raven	Tower	Empty	0	Inactive	9.85	
125	Common Raven	Tower	Empty	0	Inactive	9.87	
126	Common Raven	Tower	Empty	0	Inactive	10.06	
127	Common Raven	Cliff	Empty	0	Inactive	4.72	
128	Common Raven	Cliff	Empty	0	Inactive	7.22	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
129	Common Raven	Cliff	Empty	0	Inactive	7.41	
130	Common Raven	Cliff	Empty	0	Inactive	7.42	
131	Common Raven	Cliff	Empty	0	Inactive	7.71	
132	Common Raven	Digger Pine	Empty	0	Inactive	8.36	
133	Common Raven	Cliff	Empty	0	Inactive	10.15	
134	Common Raven	Digger Pine	Empty	0	Inactive	9.72	
135	Common Raven	Digger Pine	Empty	0	Inactive	8.66	
136	Common Raven	Cliff	Empty	0	Inactive	5.39	
137	Common Raven	Digger Pine	Empty	0	Inactive	5.37	
138	Common Raven	Cliff	Empty	0	Inactive	4.67	
139	Common Raven	Cliff	Empty	0	Inactive	5.43	
140	Common Raven	Cliff	Empty	0	Inactive	5.59	
141	Common Raven	Cliff	Empty	0	Inactive	5.36	Next to Prairie Falcon
142	Common Raven	Cliff	Empty	0	Inactive	5.48	
143	Common Raven	Cliff	Empty	0	Inactive	4.43	
144	Common Raven	Cliff	Empty	0	Inactive	5.75	
145	Common Raven	Tower	Empty	0	Inactive	9.90	
146	Common Raven	Tower	Empty	0	Inactive	10.00	
147	Common Raven	Tower	Empty	0	Inactive	9.67	
148	Common Raven	Tower	Empty	0	Inactive	9.58	Two nests in one tower; old
149	Common Raven	Tower	Empty	0	Inactive	9.58	Two nests in one tower; old
150	Common Raven	Tower	Empty	0	Inactive	9.45	
151	Common Raven	Tower	Empty	0	Inactive	9.28	
152	Common Raven	Tower	Empty	0	Inactive	9.30	
153	Common Raven	Tower	Empty	0	Inactive	9.36	
154	Common Raven	Tower	Empty	0	Inactive	9.44	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
155	Common Raven	Tower	Empty	0	Inactive	9.49	
156	Common Raven	Tower	Empty	0	Inactive	9.56	
157	Common Raven	Tower	Empty	0	Inactive	9.62	
158	Common Raven	Tower	Empty	0	Inactive	9.67	Two nests in one tower
159	Common Raven	Tower	Empty	0	Inactive	9.67	Two nests in one tower
160	Common Raven	Tower	Empty	0	Inactive	9.23	
161	Common Raven	Tower	Empty	0	Inactive	8.70	
162	Common Raven	Tower	Empty	0	Inactive	8.54	
163	Common Raven	Tower	Empty	0	Inactive	8.41	
164	Common Raven	Tower	Empty	0	Inactive	8.26	Two nests in one tower
165	Common Raven	Tower	Empty	0	Inactive	8.26	Two nests in one tower
166	Common Raven	Tower	Empty	0	Inactive	8.18	Three nests in one tower
167	Common Raven	Tower	Empty	0	Inactive	8.18	Three nests in one tower
168	Common Raven	Tower	Empty	0	Inactive	8.18	Three nests in one tower
169	Common Raven	Tower	Empty	0	Inactive	8.12	
170	Common Raven	Tower	Empty	0	Inactive	8.06	
171	Common Raven	Tower	Empty	0	Inactive	7.85	Two nests in one tower
172	Common Raven	Tower	Empty	0	Inactive	7.85	Two nests in one tower
173	Common Raven	Tower	Empty	0	Inactive	7.66	
174	Common Raven	Tower	Empty	0	Inactive	7.66	
175	Common Raven	Tower	Empty	0	Inactive	7.70	Two nests in one tower
176	Common Raven	Tower	Empty	0	Inactive	7.70	Two nests in one tower
177	Common Raven	Tower	Empty	0	Inactive	7.93	
178	Common Raven	Tower	Empty	0	Inactive	8.04	
179	Common Raven	Tower	Empty	0	Inactive	8.38	
180	Common Raven	Tower	Empty	0	Inactive	8.51	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
181	Common Raven	Tower	Empty	0	Inactive	8.64	
182	Common Raven	Tower	Empty	0	Inactive	9.17	
183	Common Raven	Tower	Empty	0	Inactive	9.89	
184	Common Raven	Cliff	Empty	0	Inactive	6.38	
185	Common Raven	Digger Pine	Empty	0	Inactive	6.63	Bowl is deep
186	Common Raven	Digger Pine	Empty	0	Inactive	9.25	
187	Common Raven	Cliff	Empty	0	Inactive	6.91	Pair of Common Ravens near
188	Common Raven	Cliff	Empty	0	Inactive	5.97	
189	Common Raven	Cliff	Empty	0	Inactive	10.10	
190	Common Raven	Cliff	Empty	0	Inactive	10.12	
191	Common Raven	Cliff	Empty	0	Inactive	10.22	
192	Common Raven	Cliff	Empty	0	Inactive	7.29	
193	Common Raven	Blue Oak	Empty	0	Inactive	7.25	deep bowl
194	Common Raven	Blue Oak	Empty	0	Inactive	9.12	deep bowl
195	Common Raven	Cliff	Empty	0	Inactive	5.78	
196	Common Raven	Cottonwood	Empty	0	Inactive	0.00	
197	Common Raven	Blue Oak	Empty	0	Inactive	6.72	
198	Common Raven	Cliff	Empty	0	Inactive	7.88	
199	Common Raven	Digger Pine	Empty	0	Inactive	7.99	Fledged young in 2013
200	Common Raven	Cliff	Empty	0	Inactive	7.53	
201	Common Raven	Cliff	Unknown	N.A.	Active	4.57	Adult on nest in incubation posture. Near two inactive Common Raven Nests
202	Common Raven	Cliff	Empty	0	Inactive	8.31	
203	Common Raven	Cliff	Empty	0	Inactive	8.32	Active in 2013
204	Common Raven	Cliff	Empty	0	Inactive	8.18	Two Common Raven nests above and to right of inactive Golden Eagle nest
205	Common Raven	Cliff	Empty	0	Inactive	9.70	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
206	Common Raven	Cliff	Empty	0	Inactive	9.66	
207	Common Raven	Cottonwood	Unknown	N.A.	Active	8.80	Adult on nest
208	Common Raven	Cliff	Empty	0	Inactive	3.33	Lower of two nests on same cliff face
209	Common Raven	Cliff	Unknown	N.A.	Active	7.56	Adult on nest in incubation posture
210	Common Raven	Cliff	Empty	0	Active	7.60	Nest is freshly built on
211	Common Raven	Cliff	Empty	0	Active	4.81	
212	Common Raven	Cliff	Empty	0	Active	4.37	Upper and smaller of two nests on face
213	Common Raven	Cliff	Empty	0	Inactive	4.37	Lower and larger of two nests on face
214	Common Raven	Cliff	Empty	0	Inactive	9.56	
215	Common Raven	Cliff	Empty	0	Inactive	9.63	Large nest
216	Common Raven	Digger Pine	Empty	0	Inactive	9.65	
217	Common Raven	Digger Pine	Empty	0	Inactive	9.92	Lower of two nests in same tree
218	Common Raven	Digger Pine	Empty	0	Inactive	9.85	Upper of two nests in same tree; pine cones in bowl
219	Common Raven	Cliff	Empty	0	Active	5.63	
220	Common Raven	Cliff	Empty	0	Inactive	5.97	
221	Common Raven	Cliff	Unknown	N.A.	Unknown	4.16	Two nests close together. Difficult to fly, so hiked in to confirm status. Lower part of canyon used heavily as firing range, possibly used by Golden Eagles in the distant past
222	Common Raven	Cliff	Empty	0	Inactive	5.69	Near active Prairie Falcon nest
223	Common Raven	Cliff	Empty	0	Active	2.32	Likely failed
224	Common Raven	Cliff	Empty	0	Inactive	7.91	Directly below another Common Raven nest on same cliff
225	Common Raven	Cliff	Empty	0	Inactive	7.91	Directly above another Common Raven nest on same cliff
226	Common Raven	Cliff	Empty	0	Active	5.95	Below an older nest. Likely failed
227	Common Raven	Cliff	Unknown	N.A.	Active	5.78	Above a newer nest. Adult on nest
228	Common Raven	Cliff	Empty	0	Active	5.60	Rebuilt in 2014. Likely failed

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
229	Common Raven	Cliff	Empty	0	Active	8.26	Rebuilt in 2014. Likely failed
230	Common Raven	Valley Oak	Eggs	1	Unknown	7.91	One Common Raven egg in an old Red-tailed Hawk nest. No Common Ravens observed
231	Common Raven	Cliff	Unknown	N.A.	Active	8.74	Adult on nest in incubation posture
232	Common Raven	Cliff	Unknown	N.A.	Active	10.68	Adult on nest in incubation posture
233	Common Raven	Cliff	Unknown	N.A.	Active	11.38	Adult on nest in incubation posture
234	Common Raven	Cliff	Unknown	N.A.	Unknown	3.37	Adult near, could not see contents clearly
281	Great Horned Owl	Cliff	Empty	0	Inactive	6.81	
282	Great Horned Owl	Cliff	Empty	0	Inactive	2.78	
283	Great Horned Owl	Cliff	Empty	0	Inactive	2.79	
284	Prairie Falcon	Cliff	Empty	0	Inactive	8.98	On top of old Common Raven nest; same cliff as Golden Eagle and Red-tailed Hawk nests
285	Prairie Falcon	Cliff	Empty	0	Inactive	7.28	Lots of whitewash
286	Prairie Falcon	Cliff	Empty	0	Inactive	7.85	
287	Prairie Falcon	Cliff	Empty	0	Inactive	4.40	
288	Prairie Falcon	Cliff	Empty	0	Inactive	10.01	
289	Prairie Falcon	Cliff	Empty	0	Inactive	10.33	
290	Prairie Falcon	Cliff	Empty	0	Inactive	10.33	
291	Prairie Falcon	Cliff	Empty	0	Inactive	8.57	
292	Prairie Falcon	Cliff	Empty	0	Inactive	9.53	
293	Prairie Falcon	Cliff	Empty	0	Inactive	9.52	
294	Prairie Falcon	Cliff	Empty	0	Inactive	7.22	
295	Prairie Falcon	Cliff	Empty	0	Inactive	6.58	
296	Prairie Falcon	Cliff	Empty	0	Inactive	6.27	On old Common Raven nest
297	Prairie Falcon	Cliff	Empty	0	Inactive	6.58	
298	Prairie Falcon	Cliff	Empty	0	Inactive	6.59	
299	Prairie Falcon	Cliff	Empty	0	Inactive	7.03	
300	Prairie Falcon	Cliff	Empty	0	Inactive	6.93	
301	Prairie Falcon	Cliff	Empty	0	Inactive	4.20	
302	Prairie Falcon	Cliff	Empty	0	Inactive	6.31	
303	Prairie Falcon	Cliff	Empty	0	Inactive	6.13	
304	Prairie Falcon	Cliff	Empty	0	Inactive	9.54	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
305	Prairie Falcon	Cliff	Empty	0	Inactive	10.14	
306	Prairie Falcon	Cliff	Empty	0	Inactive	10.20	
307	Prairie Falcon	Cliff	Empty	0	Inactive	10.14	
308	Prairie Falcon	Cliff	Empty	0	Inactive	5.19	Prairie Falcon observed near nest
309	Prairie Falcon	Cliff	Empty	0	Inactive	4.97	
310	Prairie Falcon	Cliff	Empty	0	Inactive	4.48	
311	Prairie Falcon	Cliff	Empty	0	Inactive	4.66	
312	Prairie Falcon	Cliff	Empty	0	Inactive	4.38	
313	Prairie Falcon	Cliff	Empty	0	Inactive	3.59	
314	Prairie Falcon	Cliff	Empty	0	Inactive	2.85	
315	Prairie Falcon	Cliff	Empty	0	Inactive	2.78	
316	Prairie Falcon	Cliff	Empty	0	Inactive	10.22	
317	Prairie Falcon	Cliff	Empty	0	Inactive	3.86	
318	Prairie Falcon	Cliff	Empty	0	Inactive	4.22	
319	Prairie Falcon	Cliff	Empty	0	Inactive	4.21	
320	Prairie Falcon	Cliff	Empty	0	Inactive	3.79	
321	Prairie Falcon	Cliff	Empty	0	Inactive	3.13	Three nests within 50 feet of each other. One on top and two below
322	Prairie Falcon	Cliff	Empty	0	Inactive	2.76	
323	Prairie Falcon	Cliff	Empty	0	Inactive	2.54	
324	Prairie Falcon	Cliff	Empty	0	Inactive	2.75	
325	Prairie Falcon	Cliff	Empty	0	Inactive	2.86	
326	Prairie Falcon	Cliff	Empty	0	Inactive	2.78	
327	Prairie Falcon	Cliff	Empty	0	Inactive	2.88	Over old Common Raven nest
328	Prairie Falcon	Cliff	Empty	0	Inactive	3.30	Priarie Falcon pair observed
329	Prairie Falcon	Cliff	Empty	0	Inactive	3.94	
330	Prairie Falcon	Cliff	Empty	0	Inactive	3.09	
331	Prairie Falcon	Cliff	Empty	0	Inactive	2.40	
332	Prairie Falcon	Cliff	Empty	0	Inactive	7.24	
333	Prairie Falcon	Cliff	Empty	0	Inactive	2.75	
334	Prairie Falcon	Cliff	Empty	0	Inactive	4.95	Another Prairie Falcon eyrie located on same rock
335	Prairie Falcon	Cliff	Empty	0	Inactive	4.95	Another Prairie Falcon eyrie located on same rock
336	Prairie Falcon	Cliff	Empty	0	Inactive	4.68	
337	Prairie Falcon	Cliff	Empty	0	Inactive	8.18	
338	Prairie Falcon	Cliff	Empty	0	Inactive	8.18	
339	Prairie Falcon	Cliff	Empty	0	Inactive	7.56	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
340	Prairie Falcon	Cliff	Empty	0	Inactive	4.82	
341	Prairie Falcon	Cliff	Empty	0	Inactive	5.45	
342	Prairie Falcon	Cliff	Empty	0	Inactive	5.36	Nest to Common Raven
343	Prairie Falcon	Cliff	Empty	0	Inactive	10.12	
344	Prairie Falcon	Cliff	Empty	0	Inactive	5.43	
345	Prairie Falcon	Cliff	Unknown	N.A.	Active	5.68	Adult sitting in nest in incubation posture. Nesting in old Common Raven nest. Abundant whitewash above and in nest.
346	Red-tailed Hawk	Eucalyptus	Empty	0	Inactive	8.07	
347	Red-tailed Hawk	Eucalyptus	Empty	0	Inactive	8.07	
348	Red-tailed Hawk	Eucalyptus	Empty	0	Inactive	6.43	
349	Red-tailed Hawk	Cottonwood	Empty	0	Inactive	5.07	
350	Red-tailed Hawk	Cottonwood	Empty	0	Inactive	5.33	
351	Red-tailed Hawk	Cottonwood	Empty	0	Inactive	5.41	
352	Red-tailed Hawk	Eucalyptus	Empty	0	Inactive	6.31	
353	Red-tailed Hawk	Cliff	Empty	0	Inactive	7.33	
354	Red-tailed Hawk	Cliff	Empty	0	Inactive	7.95	
355	Red-tailed Hawk	Cliff	Empty	0	Inactive	7.38	
356	Red-tailed Hawk	Cliff	Empty	0	Inactive	6.93	
357	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.25	
358	Red-tailed Hawk	Cliff	Empty	0	Inactive	3.33	
359	Red-tailed Hawk	Cliff	Empty	0	Inactive	3.45	
360	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.65	
361	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.53	
362	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.41	
363	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.20	Two nests in same tree
364	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.20	Two nests in same tree
365	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.08	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
366	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	8.07	
367	Red-tailed Hawk	Unknown Oak	Empty	0	Inactive	6.42	
368	Red-tailed Hawk	Cottonwood	Empty	0	Inactive	1.26	
369	Red-tailed Hawk	Cliff	Empty	0	Inactive	1.85	
370	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.02	
371	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.21	
372	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.52	
373	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.27	
374	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.89	
375	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.71	
376	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.78	Near Common Raven nest
377	Red-tailed Hawk	Cliff	Empty	0	Inactive	3.54	
378	Red-tailed Hawk	Cliff	Empty	0	Inactive	9.92	
379	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.26	
380	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.25	
381	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.17	
382	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.66	
383	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.64	
384	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.49	Near another Red-tailed Hawk nest in adjacent tree
385	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.51	Near another Red-tailed Hawk nest in adjacent tree
386	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	4.91	Same territory as nearby nest
387	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	4.97	Same territory as nearby nest
388	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	4.94	
389	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	5.01	
390	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	1.75	
391	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	3.24	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
392	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	3.29	
393	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	3.46	
394	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	3.47	
395	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	3.47	Nest falling apart
396	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	3.56	
397	Red-tailed Hawk	Cliff	Empty	0	Inactive	2.56	
398	Red-tailed Hawk	Cliff	Empty	0	Active	6.20	
399	Red-tailed Hawk	Cottonwood	Empty	0	Inactive	5.04	
400	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	5.04	
401	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.25	
402	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.19	
403	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.94	
404	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.75	
405	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.19	
406	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.31	
407	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.36	
408	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.73	
409	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.37	
410	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.27	
411	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	9.83	
412	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	9.95	
413	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	10.29	
414	Red-tailed Hawk	Windmill	Empty	0	Inactive	9.47	
415	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.28	
416	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.21	
417	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.23	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
418	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.14	
419	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.10	
420	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.62	
421	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.26	
422	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	6.82	
423	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	6.79	
424	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.65	
425	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	6.70	Two nests near each other
426	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.07	
427	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	6.84	
428	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.51	
429	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.42	
430	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.17	
431	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.00	
432	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	5.64	
433	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	5.71	
434	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	5.56	
435	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	5.56	
436	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	5.37	
437	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	5.78	
438	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	9.86	
439	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.29	
440	Red-tailed Hawk	Valley Oak	Empty	0	Active	8.88	
441	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.27	
442	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.49	
443	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.38	

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
444	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.27	
445	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	9.41	
446	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	8.30	
447	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	1.17	
448	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	7.09	
449	Red-tailed Hawk	Tower	Empty	0	Inactive	9.87	Red-tailed Hawk perched nearby
450	Red-tailed Hawk	Tower	Empty	0	Inactive	9.93	Red-tailed Hawk perched nearby
451	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.82	
452	Red-tailed Hawk	Cliff	Empty	0	Inactive	7.19	
453	Red-tailed Hawk	Tower	Empty	0	Inactive	9.90	Red-tailed Hawk perched nearby
454	Red-tailed Hawk	Tower	Empty	0	Inactive	9.47	
455	Red-tailed Hawk	Digger Pine	Empty	0	Active	8.14	New nest bowl. Two adults near
456	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.10	Two adults near
457	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	6.91	Old nest
458	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	7.54	
459	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	9.51	
460	Red-tailed Hawk	Cliff	Empty	0	Inactive	6.74	
461	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.51	
462	Red-tailed Hawk	Cliff	Empty	0	Inactive	4.43	
463	Red-tailed Hawk	Cliff	Eggs	2	Incubating	4.50	Newly built nest this year.
464	Red-tailed Hawk	Cliff	Empty	0	Inactive	3.33	Upper of two nests on same cliff face
465	Red-tailed Hawk	Cliff	Empty	0	Inactive	3.87	
466	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	7.22	Fledged young in 2013
467	Red-tailed Hawk	Cliff	Empty	0	Inactive	10.19	Old nest, only remnants or possibly never built completely
468	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	8.64	Adult Red-tailed Hawk near nest acting territorial, but nest not built on

ID	Species	Substrate	Contents	Quan.	Status	Project Dist. (mi.)	Notes
469	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	5.68	
470	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	4.34	
471	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	5.11	
472	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	5.16	Old nest
473	Red-tailed Hawk	Digger Pine	Unknown	N.A.	Active	8.25	Adult on nest
474	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	9.24	
475	Red-tailed Hawk	Cliff	Empty	0	Active	3.80	Fresh, built this year. No grasses.
476	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	9.55	
477	Red-tailed Hawk	Cliff	Empty	0	Inactive	5.57	Located below old Golden Eagle nest
478	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	8.88	
479	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	9.50	
480	Red-tailed Hawk	Cliff	Empty	0	Inactive	5.73	
481	Red-tailed Hawk	Cliff	Empty	0	Inactive	7.68	
482	Red-tailed Hawk	Valley Oak	Eggs	2	Active	9.58	Adult observed incubating
483	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.03	
484	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.14	
485	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.55	
486	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.08	
487	Red-tailed Hawk	Valley Oak	Empty	0	Active	8.19	Freshly lined with lichens on Jan. 23. Empty and no activity on Apr. 5.
488	Red-tailed Hawk	Blue Oak	Empty	0	Inactive	8.44	Large bowl
489	Red-tailed Hawk	Valley Oak	Empty	0	Inactive	7.28	Old, remnants of a large stick nest
490	Red-tailed Hawk	Digger Pine	Empty	0	Inactive	4.26	
491	Red-tailed Hawk	Cliff	Unknown	N.A.	Active	3.43	Adult on nest in incubation posture
492	Turkey Vulture	Cliff	Empty	0	Inactive	6.91	

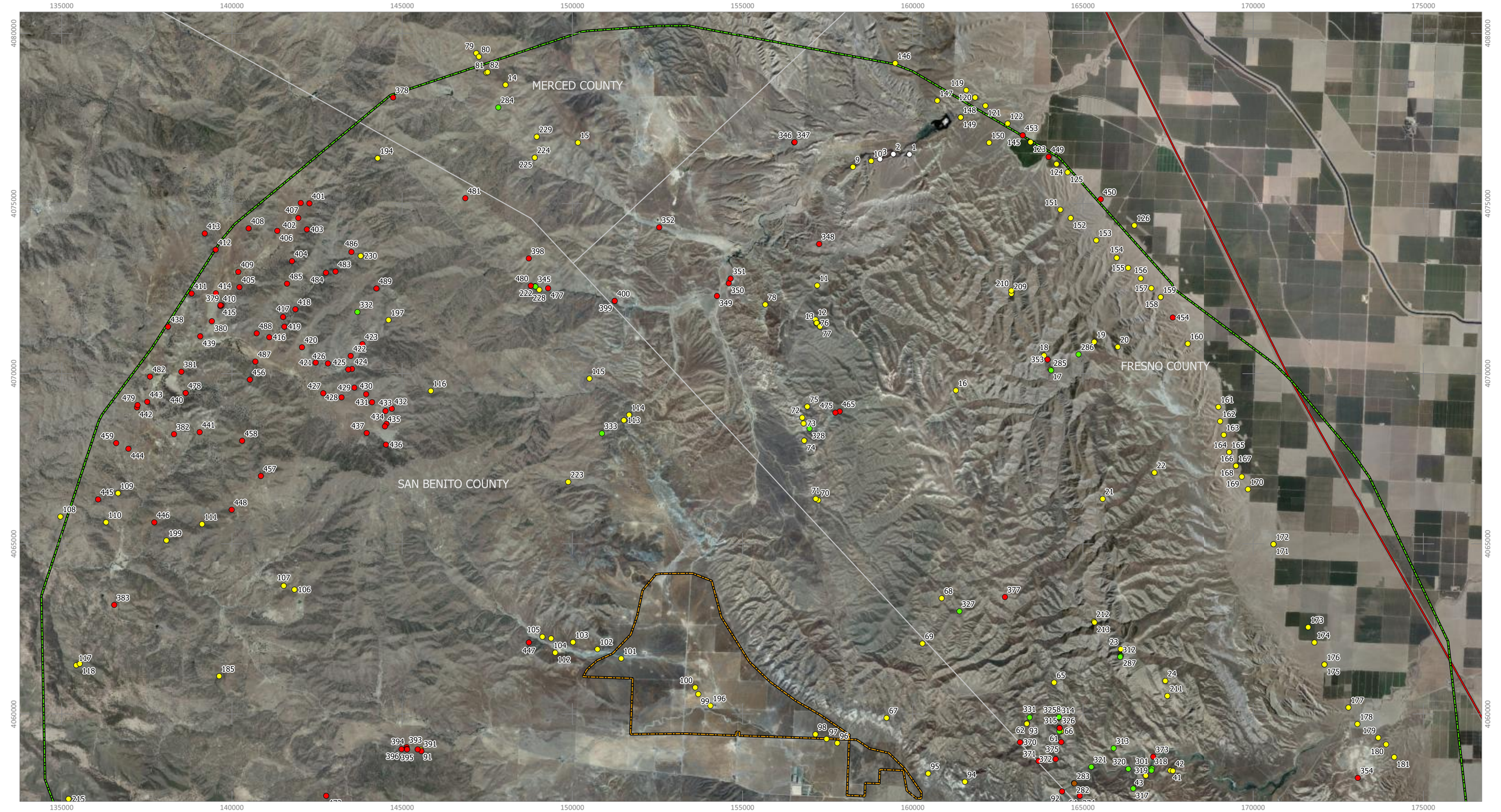

EXHIBIT 2. 2014 Nesting Survey: Non-Golden Eagle Results (Northern Study Area)

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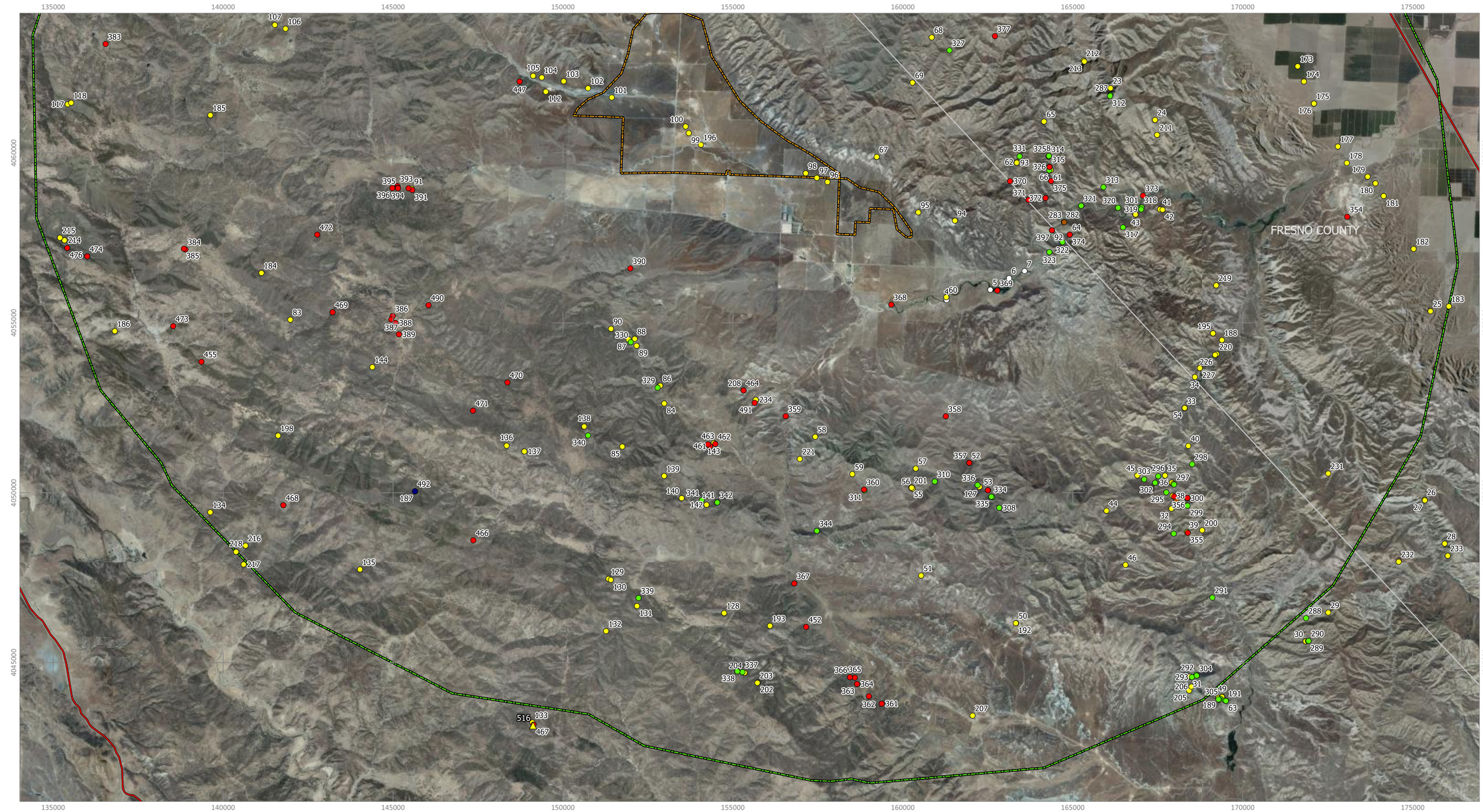
BBI



County Border
Major Road
Proposed Project Boundary
Study Area

Special Status Species Observations
California Condor

Nest Locations
Barn Owl
Common Raven
Prairie Falcon
Great Horned Owl
Red-tailed Hawk
Turkey Vulture

5000 0 5000 10000 15000 20000 ft
1:105,791

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 5/8/2014
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 3. 2014 Nesting Survey: Non-Golden Eagle Results (Southern Study Area)

Panoche Valley Solar Project | Merced, Fresno and San Benito Counties, California

BBI

APPENDIX C. SPECIES LIST

The following list of 36 bird and 10 mammal species represents a complete compendium of vertebrate species detected during surveys by BBI biologists in January and April, 2014. Sensitive status designations are derived directly from the California Department of Fish and Wildlife's California Wildlife Habitats Relationship Database. Sensitive statuses in this database may pertain only to a subspecies or genetically distinct population of the species, and are included here only if the sensitive population has the potential to occur in the Study Area.

Birds

Common Name	Scientific Name	FE	FT	CE	CT	CFP	SSC
Mallard	Anas platyrhynchos						
California Quail	Callipepla californica						
Chukar	Alectoris chukar						
Wild Turkey	Meleagris gallopavo						
Cattle Egret	Bubulcus ibis						
White-faced Ibis	Plegadis chihi						
Turkey Vulture	Cathartes aura						
Bald Eagle	Haliaeetus leucocephalus			X		X	
Northern Harrier	Circus cyaneus						
Cooper's Hawk	Accipiter cooperii						
Red-tailed Hawk	Buteo jamaicensis						
Ferruginous Hawk	Buteo regalis						
Golden Eagle	Aquila chrysaetos					X	
Killdeer	Charadrius vociferus						
Rock Pigeon	Columba livia						
Greater Roadrunner	Geococcyx californianus						
Barn Owl	Tyto alba						
Great Horned Owl	Bubo virginianus						
Acorn Woodpecker	Melanerpes formicivorus						
Northern Flicker	Colaptes auratus						
American Kestrel	Falco sparverius						
Merlin	Falco columbarius						
Prairie Falcon	Falco mexicanus						
Loggerhead Shrike	Lanius ludovicianus	X					
Western Scrub-Jay	Aphelocoma californica						
Yellow-billed Magpie	Pica nuttalli						
American Crow	Corvus brachyrhynchos						
Common Raven	Corvus corax						
Canyon Wren	Catherpes mexicanus						
Western Bluebird	Sialia mexicana						
California Thrasher	Toxostoma redivivum						
European Starling	Sturnus vulgaris						

California Towhee	Melozone crissalis						
Western Meadowlark	Sturnella neglecta						
House Finch	Haemorhous mexicanus						

Mammals

Common Name	**Scientific Name**	**FE**	**FT**	**CE**	**CT**	**CP**	**SSC**
Desert Cottontail	Sylvilagus audubonii						
Black-tailed Jackrabbit	Lepus californicus						X
California Ground Squirrel	Spermophilus beecheyi						
Coyote	Canis latrans						
Gray Fox	Urocyon cinereoargenteus						
American Badger	Taxidea taxus						X
Bobcat	Lynx rufus						
Wild Pig	Sus scrofa						
Elk	Cervus elaphus						
Mule Deer	Odocoileus hemionus						

APPENDIX D. RESUMES

Peter H. Bloom, Ph.D. | President

Qualifications

Peter Bloom has been a professional environmental consultant for more than 35 years, principally in California. He specializes in the environmental sciences, is an internationally recognized expert in raptor biology and conservation and is considered one of the best all-around field biologists in California with his extensive knowledge and experience with all terrestrial vertebrate groups (amphibians, reptiles, birds, and mammals) and the vascular plants. Corporate clients for whom he has prepared or contributed to the production of numerous biological assessments and environmental impact reports include The Irvine Company, Rancho Mission Viejo, Tejon Ranch, Newhall Ranch, Ahmanson Ranch, Metropolitan Water District, and Los Angeles Department of Water and Power. He has also worked extensively with the Department of Defense, U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, U.S. Forest Service, California Department of Fish and Game, and various non-profit conservation groups providing valuable research and advice, primarily on raptor ecology and conservation. He has conducted avian and herpetological research in the western United States, Alaska, Peru, Ecuador, and India and has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to regional conservation planning. Dr. Bloom has published more than 30 peer-reviewed scientific papers and technical reports and taught California natural history at a local junior college for more than 12 years.

Professional Experience

As founder and President of Bloom Biological, Inc., Dr. Bloom has prepared numerous biological assessments and worked on an array of avian research projects in the western United States, Alaska, Peru, Ecuador, and India, spending over 600 hours conducting helicopter and fixed-wing nest survey work and aerial radio-tracking of eagles, California condors, hawks, and herons. He has also been responsible for conducting or supervising:

- fiber-optics and electrical powerline installation surveys and construction monitoring;
- surveys of nesting and wintering birds of prey for the California Department of Fish and Game (CDFG), BLM, U.S. Forest Service, Department of Defense, and numerous private land owners;
- transponder and radio-tagging of adult California red-legged frogs in Ventura County;
- focused surveys for California gnatcatcher, southwestern willow flycatcher, least Bell's vireo, yellow-billed cuckoo, Swainson's hawks, golden eagles, arroyo toad, California red-legged frog, desert tortoise, Pacific pond turtle (including trapping and surveying habitat), coast horned lizard, flat-tailed horned lizard, Belding's orange-throated whiptail, coastal whiptail, southern rubber boa, coastal patch-nosed snake, California glossy snake, two-striped garter snake (including trapping and surveying habitat), red-diamond rattlesnake, southern flying squirrel, and Pacific pocket mouse;
- general herpetological, small mammal, breeding and winter bird surveys in southern California;
- translocation of several hundred arroyo toads at Camp Pendleton Marine Corps Base;
- sensitive herpetological, mammal, and raptor surveys for the Transportation Corridor Agency in Orange County; and
- a raptor status and management plan for Naval Weapons Station, Seal Beach and Fallbrook Detachment.

As a research biologist at the Western Foundation of Vertebrate Zoology, served on the Science Advisory Board of the South Orange County Natural Communities Conservation Program. During his tenure there he:

- provided herpetological input into the Orange County environmental GIS and Cleveland National Forest environmental inventory.
- managed a long-term (30 yr.) raptor ecology study in California;
- managed a successful Great Blue Heron mitigation project designed to increase numbers of nesting herons through placement of artificial nest platforms;
- supervised and performed predator management activities for USFWS related to protection of California least terns, snowy plovers, and light-footed clapper rails in southwestern California from avian and other vertebrate predators (locations included Vandenberg Air Force Base, Naval Weapons Station Seal Beach, Batiquitos Lagoon, Port of Long Beach, Port of San Diego, and Tijuana Slough National Wildlife Refuge);
- supervised a two year CalTrans radio-telemetry study of nesting peregrine falcons and their relationship to California least terns in southwestern California; and
- organized and finished seven years of a MAPS passerine monitoring station.
- Together with sub-permittees, banded ~ 45,000 birds, mostly nestlings (1970 – 2013).

While serving as a research biologist and advisor in India, responsibilities included educating local biologists in the various techniques needed to capture birds, and conducting radio-telemetry research.

Served as thesis advisor to seven students at CSU Long Beach, one student at CSU Humboldt, and one student at CSU Fullerton.

As research biologist for the National Audubon Society, was responsible for writing the grant proposal and ultimately the successful award of two grants totaling $300,000 for six years of fulltime research on the ecology of southern California raptor populations. Responsibilities included project management, personnel selection, supervision of 12 volunteers, proposal and budget preparation, method design, data analysis, report writing, and publication of results. Directed the effort to capture all wild free-flying California condors for transmitter placement or captive breeding. Radio-tracked condors and conducted contaminant studies involving condors and 180 golden eagles.

As a research biologist at the University of California, Santa Cruz, was principal investigator on a three year study designed to determine the status of northern goshawk populations in California for CDFG.

Trapped and placed transmitters on great gray owls for the National Park Service , prairie falcons for CDFG, and peregrine falcons in Peru for the Bodega Bay Institute of Pollution Ecology.

As a wildlife biologist for BLM, was principal investigator of a study designed to determine the status of the Swainson's hawk in California. Surveyed all semi-arid and desert regions, reviewed literature and museum records, assessed reproduction, banded adults and young, and prepared the final report. His efforts contributed to the state-listing of Swainson's hawk as threatened.

Surveyed and reported on the ecology and distribution of raptors inhabiting the 200-square-mile Camp Pendleton Marine Corps Base.

While serving as a biological technician for BLM, conducted reptile, amphibian, small mammal, and avian surveys of 3.25 million acres of public land as part of a grazing EIS.

Education

Ph.D., Natural Resources, College of Natural Resources, University of Idaho, Moscow
M.S., Biology, California State University, Long Beach
B.S., Zoology, California State University, Long Beach

Awards

Graduation with Honors – Best Thesis Award School of Natural Sciences 1979
The Wildlife Society Western Section: Professional of the Year, 2005

Association of Field Ornithologists: Bergstrom Award, 1981
The Nature Conservancy: $27,000 for satellite transmitters, 2004 and 2006

Permits & Certifications

Federal endangered species recovery permit (TE-787376) for red-legged frog (including placement of transmitters and transponders), arroyo toad, California gnatcatcher (including banding), least Bell's vireo (including banding), southwestern willow flycatcher (including banding), California least tern, snowy plover, peregrine falcon (banding), bald eagle (banding), and Swainson's hawk (banding).

California scientific collecting permit and memorandum of understanding for all raptors, including state-threatened Swainson's hawk, reptiles, amphibians, small mammals, and many additional species of birds, including state-threatened western yellow-billed cuckoo, California least tern, snowy plover, peregrine falcon, and bald eagle
Federal Master Banding Permit No. 20431
Federal Bird Marking and Salvage Permit
Predator Management Permit
Migratory Bird Relocation Permit (burrowing owl and other species)

Brown-headed cowbird trapping authorization

Desert Tortoise Council-approved for conducting desert tortoise monitoring surveys

Selected Publications

Home range and habitat use of Cooper's Hawks in urban and natural areas. C.A. Lepczyk and P.S. Warren (eds). Studies in Avian Biology No. 45. www.ucpress.edu/go/sab. 2012. (with Chiang, S.N., P.H. Bloom, A.M.Bartuszevige and S. E. Thomas)

Impact of the lead ammunition ban on reducing lead exposure in golden eagles and turkey vultures in California. PloS One. 18 pgs. 2011. (with Kelly, T.R., S. Torres, Y. Hernandez, R. Poppenga, W.M. Boyce, and C.K. Johnson)

Vagrant western Red-shouldered Hawks: Origins, natal dispersal patterns and survival. The Condor. 113:538-546. 2011. (with J.M. Scott, J.M. Papp, J.W. Kidd, S. Thomas)

Capture techniques. Pgs. 193 – 219. In Bird and Bildstein (eds). Raptor research and management techniques. Hancock House, Blaine, WA. 2007. (with W.S. Clark and J.W. Kidd)

Status of Burrowing Owls in southwestern California. In Proceedings of the California burrowing owl symposium, November 2003. Bird populations monographs No. 1. Institute for Bird Populations and Albion Environmental, Inc. 2007. (with Kidd, J.W., P.H. Bloom, C.W. Barrows and C.T. Collins)

Turkey vulture marking history: the switch from leg bands to patagial tags. *North American Bird Bander* 30:59-64. 2005. (with C. S. Houston)

Basic II and basic III plumages of rough-legged hawks. *Journal of Field Ornithology* 76:83-89. 2005. (with William Clark)

Molt and sequence of plumages of golden eagles, and a technique for in-hand ageing. *North American Bird Bander* 26:97-116. 2001. (with William Clark)

The status of Harlan's hawk in southern California. *Western Birds* 31:200-202. 2000. (with Charles Collins)

Post-migration weight gain of Swainson's hawks in Argentina. *Wilson Bulletin* 111:428-432. 1999. (with M. I. Goldstein, J. H. Sarasola, and T. E. Lacher)

Characteristics of red-tailed hawk nest sites in oak woodlands of central California. Proceedings of a Symposium on Oak Woodlands: Ecology, Management, and Urban Interface Issues. Pgs. 365-372. 1998. (with W. D. Tietje, and J. K. Vreeland)

The urban buteo: red-shouldered hawks in southern California. Pgs 31-39 in: Raptors in Human Landscapes, Adaptations to Built and Cultivated Environments. 1996. D. M. Bird, D. E. Varland,, and J. J. Negro, eds. Academic Press. (with M. D. McCrary)

Reproductive performance, age structure, and natal dispersal of Swainson's hawks in the Butte Valley, California. Journal of Raptor Research 29:187-192. 1995. 1995. (with B. Woodbridge and K. K. Finley)

The biology and current status of the long-eared owl in coastal southern California. Bulletin of the Southern California Academy of Sciences 93:1-12. 1994.

Red-shouldered hawk home range and habitat use in southern California. Journal of Wildlife Management 57:258-265. 1993. (with M. D. McCrary and M. J. Gibson)

The dho-gaza with great horned owl lure: an analysis of its effectiveness in capturing raptors. Journal of Raptor Research 26:167-178. 1992. (with J. L. Henckel, E. H. Henckel, J. K. Schmutz, B. Woodbridge, J. R. Bryan, R. L. Anderson, P. J. Detrich, T. L. Maechtle, J. O. McKinley, M. D. McCrary, K. Titus, and P. F. Schempf [Bloom senior author])

Lead hazards within the range of the California condor. The Condor 92:931-937. 1990. (with O. H. Pattee, J. M. Scott, and M. R. Smith)

Investigations of the decline of Swainson's hawk populations in California. Journal of Raptor Research 23:63-71. 1990. (with R. W. Risebrough, R. W. Schlorff, and E. E. Littrell)

Importance of riparian systems to nesting Swainson's hawks in the Central Valley of California. Pgs. 612-618 in Warner, R.E. and K.M. Hendrix eds., California Riparian Systems, Ecology, Conservation, and Productive Management. University of California Press. 1984. (with R. D. Schlorff)

Michael Kuehn, Ph.D. | Senior Biologist & Statistical Analyst

Qualifications

Dr. Kuehn is an avian ecologist with experience conducting field research throughout the Americas from Ecuador to Alaska. He also has a solid working knowledge of the other terrestrial vertebrate groups (amphibians, reptiles, and mammals), and has taught courses about their ecology and identification at UC-Santa Barbara. He is familiar with the fauna and flora of coastal California and the Mojave/Sonoran Desert regions. He has studied nesting birds for 15 years, principally in California, Nevada, Arizona, Montana, Idaho and Alaska, but also in Ecuador. Dr. Kuehn has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to studies aimed at understanding specific stressors on regional avian communities. He has designed and conducted numerous avian field studies, and supervised field crews during the implementation of these studies in addition to performing statistical analysis and interpretation of data for report preparation.

Professional Experience

As a biologist at Bloom Biological, Dr. Kuehn has worked for three years in a variety of capacities to help design and conduct ecological assessments and prepare permitting documents, including the following:

Development of statistically valid pre-construction and post-construction avian survey protocols that meet federal and state permit requirements for alternative energy projects.

Managed multiple environmental assessments at alternative energy projects, involving survey design and site selection, training biologists to follow specific survey methods and protocols, scheduling and data management, as well as GIS management, data synthesis, statistical analysis and report preparation.

Contributed to the drafting of multiple Eagle Conservation Plans for wind energy projects seeking to apply for USFWS programmatic incidental eagle take permits.

Experienced with the application of field survey data to generate eagle fatality estimates for wind energy projects using the USFWS-developed Bayesian fatality prediction model using R Statistical software.

Conducted field surveys for a variety of passerine birds, owls, and other raptors.

Trained in raptor trapping (including Golden Eagles) and radio telemetry tracking of tagged birds.

Worked as an avian specialist, conducting nest searching and monitoring for the Sunrise Powerlink Project in San Diego and Imperial counties in California.

Assisted in creating burrows and conducting surveys for Burrowing Owls.

Dr. Kuehn also has the following experience:

As a research assistant at the Western Foundation of Vertebrate Zoology, conducted surveys for Loggerhead Shrikes on Santa Cruz Island and for all bird species along the Santa Clara River (Ventura County).

As a research associate at the University of California, Santa Barbara, designed and directed a two-year study investigating the effects of a tamarisk biocontrol agent on avian communities using riparian habitat in southern Nevada.

Served on a Technical Advisory Committee for a Walton Family Foundation funded initiative to restore habitat for Southwestern Willow Flycatchers in the Colorado Basin in the wake of Tamarisk biocontrol beetle introduction during 2011 and 2012.

Conducted independent research on reproductive strategies of birds breeding at high latitudes in central Alaska.

As a graduate student at UC Santa Barbara, conducted seven years of field research in Alaska, Idaho and Montana to investigate the behavioral defenses of hosts against Brown-headed Cowbird parasitism.

Participated for four years in a long-term ecological investigation of landscape effects on nesting success of riparian birds in Western Montana

Participated in a study of nesting birds in the cloud-forests of central and southern Ecuador.

Education

Ph.D., University of California, Department of Ecology, Evolution and Marine Biology, Santa Barbara

B.S., Fisheries and Wildlife Management, Lake Superior State University, Sault Ste. Marie, Michigan

Awards

Worster Award for Graduate/Undergraduate Collaborative Research, Department Ecology, Evolution and Marine Biology, University of California, Santa Barbara ($6000). 2007

Frank M. Chapman Memorial Grant, American Museum of Natural History ($2500). 2007
Student Research Award, Animal Behavior Society ($1000). 2007

Exploration Fund Award, Explorer's Club ($1200). 2007

Paul A. Stewart Research Award, Wilson Ornithological Society ($500). 2007

Ralph Schreiber Ornithology Research Award, Los Angeles Audubon Society ($2500). 2006

Student Research Award, American Ornithologist's Union ($1800). 2003

Permits & Certifications

USFWS Sci. Collector's Permit (MB085567-0)

USGS Bird Banding Subpermitee (22905-F)

Selected Publications

Kuehn, M. J., B. D. Peer, and S. I. Rothstein. (*Submitted Dec. 25, 2013*). Expression of Nest Defense Behaviors by a Brood Parasite Host is Experience-Dependent and Retained in the Absence of Parasitism. Evolution.

Kuehn, M. J., B. D. Peer, and S. I. Rothstein. 2014. Variation in host response to brood parasitism reflects evolutionary differences and not phenotypic plasticity. Anim. Behav. 88:21-28.

Peer, B. D., M. J. Kuehn, S. I. Rothstein and R. C. Fleischer. 2011. Persistence of host defence behavior in the absence of avian brood parasitism. Biology Letters. 7(5): 670-673.

Peer, B. D., C. E. McIntosh, M. J. Kuehn, S. I. Rothstein and R.C. Fleischer. 2011. Complex biogeographic history of lanius spp. shrikes and its implications for the evolution of defenses against avian brood parasitism. Condor. 113(2): 385-394.

Bateman, H.L., T.L. Dudley, D.W. Bean, S.M. Ostoja, K.R. Hultine, and M.J.Kuehn. 2010. A river system to watch: documenting the effects of saltcedar (Tamarix spp.) biocontrol in the Virgin River Valley. Ecological Restoration. 28:405-410.

Rivers, J. W., and M. J. Kuehn. Predation of eared grebe by great blue heron. 2007. Wilson Journal of Ornithology. 118(1): 112-113.

Peer, B. D., S. I. Rothstein, M. J. Kuehn and R. C. Fleischer. 2005. Host defenses against cowbird Molothrus spp. parasitism: implications for cowbird management. Pp. 84-97 in C. P. Ortega, J. F. Chace and B. D. Peer eds., Management of cowbirds and their hosts: balancing science, ethics and mandates. Ornithological Monographs. No. 57.

Tewksbury, J. J., T. E. Martin, S. J. Hejl, M. J. Kuehn and W. J. Jenkins. 2002. Parental care of a cowbird host: caught between the costs of egg-removal and nest predation. Proc. R. Soc. Lond. B. 269: 423-429.

Dobbs, R.C., P.R. Martin, and M. J. Kuehn. 2001. On the nest, eggs, nestlings, and parental care in the Scaled Antpitta (Grallaria guatimalensis). Ornithologia Neotropical 2:225-233

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

SUMMARY OF BIOTIC RESOURCES SOLARGEN ENERGY'S PANOCHE RANCH SOLAR FARM

Prepared by:
Live Oak Associates, Inc.

Rick Hopkins, Ph.D., Principal and Senior Conservation Biologist
Michele Kopros, Senior Project Manager and Wildlife Biologist
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TABLE OF CONTENTS

1 INTRODUCTION

The following is a summary of a reconnaissance survey conducted by Live Oak Associates, Inc. (LOA) between 1 and 3 April 2009 on the proposed Panoche Ranch Solar Farm located in the Panoche Valley, San Benito and Fresno Counties, California. This summary offers an overview of the proposed project and discusses the biotic resources directly observed during the reconnaissance survey and also those that are historically know to occur in the site's vicinity.

1.1 PROJECT DESCRIPTION

Solargen Energy Inc. proposes to construct and operate a 1.5 Gigawatt solar photovoltaic (PV) energy generating facility that would be named the Panoche Ranch Solar Farm (Farm). The proposed location of the Farm is on private lands in the Panoche Valley, the majority of which (approximately 10,000 acres) are located in the eastern portion of San Benito County. A smaller area of approximately 900 acres is located north of Mercey Hot Springs in western Fresno County.

The Farm is proposed, in part, to support California in meeting the Renewable Portfolio Standard mandate, requiring investor-owned utilities to supply 20% of their total electricity through renewable energy by the year 2010. Benefits of the proposed Farm include the following:

- Direct conversion of sunlight to electricity through the PV effect does not require water to generate electricity
- Solargen's PV panels consist of non-toxic materials such as glass, silicon, concrete and steel
- The Farm would offset potential emissions of greenhouse gases that contribute to climate change and other pollutants such as nitrogen dioxide from fossil fuel fired power plants

The Farm would be constructed on contiguous parcels of land historically used for grazing. A buffer zone with a minimum width of 35-feet would be maintained between the PV panels and surrounding land and the operation of the Farm would not interfere with adjacent land uses currently in place.

The selection of the site in Panoche Valley is based mainly on sun light, topography and proximity to the Moss to Panoche transmission line owned by PG&E. This line provides a unique opportunity to connect energy produced at the Farm to an existing point on the system with available electric transmission capacity. The Panoche Valley offers a relatively level valley floor, occurring between approximately 1240 and 1400 feet above sea level. The Panoche Valley area supports a strong solar resource according to the National Renewable Energy Laboratory Solar Radiation Database (http://www.nrel.gov/gis/data_analysis.html), which has collected data for the last decade on various locations around the United States. The Farm would be expected to remain in operation for at least 30 years, with the possibility of a subsequent re-powering for additional years of operation. The energy produced here would mainly benefit users in San Benito and Fresno Counties, though outlying customers would also receive a portion of their energy from the Farm.

The Farm would consist primarily of PV panels on steel support structures, which would be dark in color. These panels would be arranged in rows, with panels tilting upward and facing south or southwest. Each panel would be 7- by 8-feet and they would stand no more than 15-feet above the ground. The panels would be arranged in blocks, and each block would be supported by an inverter and transformer. These units would stand no more than 25-feet above the ground. Medium-voltage collection system lines would be buried underground. It is believed that this system, with no moving parts, no thermal cycle, no water needs, a low visual profile and underground collection system would help minimize the Farm's potential impacts to the environment.

Due to the topography of the Panoche Valley, the installation of the Farm would not require large-scale grading. The main areas of grading would occur for all-weather access roads, the Farm substation, and an operations and maintenance (OM) facility. The roads would be heavily used during the construction phase, and then rarely used for maintenance in subsequent years.

As stated previously, the Farm would not require water to generate electricity. However, some water would be required for sanitary facilities and for periodic panel cleaning. It is estimated that these uses would require approximately 10.5 acre-feet of water per year, based on a one time per year cleaning schedule. This annual water demand represents approximately 6% of that used for a similar-sized solar thermal facility, based on recent California Energy Commission information. It is estimated that the construction of the Farm would take approximately 6 years to complete, and during this time, additional water would be necessary for sanitary facilities, dust control, initial panel washing and manufacturing concrete. Solargen is exploring opportunities to clean and recycle gray water for reuse onsite. Existing onsite wells should be sufficient to serve the Farm's water needs, however thorough studies of the water resources both onsite and in the greater Panoche Valley area are planned.

An approximately 5-acre substation is proposed as part of the project, and includes an adjacent area of up to 2 acres to be occupied by an OM facility, including a small parking area. One or more cement pads would be constructed as foundations for substation equipment, and other areas would utilize a gravel substrate. An 8-foot chain link fence would be constructed around the substation. These facilities would be strategically placed adjacent to the existing PG&E Moss to Panoche 230 kV transmission line. In addition to the substation and OM facility, there would be approximately one gear switch house for every 40 inverter and transformer combinations, each of which would have similar dimensions to the inverters and transformers.

2 EXISTING CONDITIONS

The outline of the proposed project is irregularly-shaped consisting of two blocks of land. The main area being considered is approximately 10,000 acres consisting of all or part of Township 15S, Range 10E, Sections: 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25; and Township 15S, Range 11E, Sections: 18, 19, 20, 29, and 30 all located in the eastern region of San Benito County, California, in an area known as the Panoche Valley. The majority of parcels within the site are used for cattle grazing. The site is surrounded by rangeland and bordered to the west by the Gabilan Range and to the east by the Panoche Hills. A number of drainages and creeks are present in the area including the Panoche and Las Aguilas Creeks. The portion of the Valley associated with the proposed project ranges in elevation from approximately 1240 feet National Geodetic Vertical Datum (NGVD) to approximately 1400 NGVD.

The second area being considered by the applicant is a smaller parcel of approximately 900 acres located just east of the Little Panoche Reservoir and northeast of Mercey Hot Springs, in an area known as Little Panoche Valley in western Fresno County. The outline of this parcel is also irregularly-shaped, and encompasses portions of Township 13S, Range 11E, Sections: 20, 21, 28, 29 and 30. This area is basically a plateau with an elevation range of approximately 700 feet NGVD to 1,000 feet NGVD, featuring several ravines. Land uses in this area are the reservoir, the Little Panoche Wildlife Area, an old tire dump, and almond orchards; the Little Panoche Creek is in close proximity. The site itself is currently used for grazing cattle.

Like much of California, the sites and their surroundings experience a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges between 8- and 10-inches, almost 85% of which falls between October and March. Nearly all precipitation falls in the form of rain. Stormwater runoff readily infiltrates the sites' soils; when field capacity has been reached, gravitational water flows into the creeks and drainages.

2.1 BIOTIC HABITATS

Although the biotic habitats vary within Panoche Valley, the areas suitable for developing a solar farm are comprised of annual, non-native grasslands used mainly to graze cattle. It was in these areas that LOA focused reconnaissance surveys. Stock ponds were observed in Section 4 and, as mentioned above, Panoche and Las Aguilas Creeks and a number of unnamed drainages and washes traverse the grasslands. Most of the waterways were dry during the April 2009 surveys, and consisted mainly of gravely bottoms.

At the time of the April 2009 reconnaissance survey, much of Panoche Valley was heavily grazed by livestock. Prominent grass species observed during the April visit included ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum ssp. leporinum*) and rat-tail fescue (*Vulpia myuros*). Dominant forbs included broad-leaved filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum var. nitidum*) and vinegarweed (*Tricostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullein (*Eremocarpus setigerus*) and bur clover

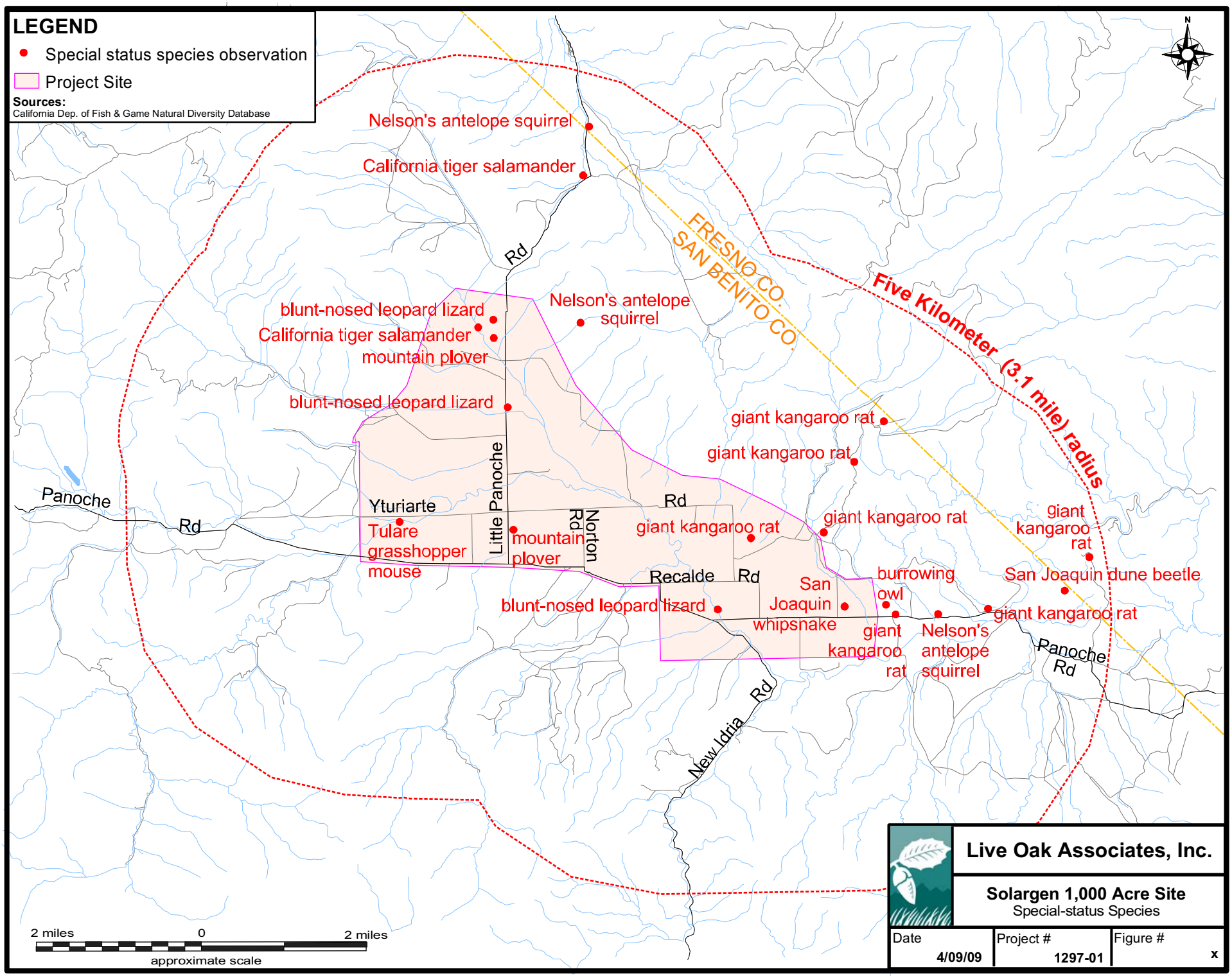
(*Medicago polymorpha*) were also common, especially along ranch roads. Species diversity increased in areas less disrupted by livestock or historic cultivation and included a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitaum*), California gold fields (*Lasthenia californica*), tidy-tips (*Layia platyglossa*) and California creamcups (*Platystemon californicus*).

Rangelands of the site, like grasslands throughout the region, serve as productive biotic habitats supporting a large diversity of native terrestrial vertebrates. Open habitats of the region provide significant foraging habitat for a variety of resident and wintering raptors, as well as granivorous (seed-eating) birds. The cover of native and non-native grasses and forbs provide cover for large populations of small mammals that, in turn, attract a diversity of predatory species. A number of these species are expected to utilize grasslands occurring on the site throughout all or part of the year as breeding and/or foraging habitat and many species remain during their entire life cycle. Some of these species are given special status listing (Figures 1 and 2).

Amphibians would be limited onsite due to the dominance of upland habitat; however, amphibians likely use the stock ponds found in Range 10E, Section 4 and utilize the waters of the creeks and drainages when they are flowing. Due to the large amount of acreage and a limited amount of time to conduct reconnaissance surveys, these ponds and drainages were not surveyed in detail. Access to section 4 was not obtained at the time of the reconnaissance level survey therefore examination of the stock ponds was not possible. Amphibian species that could occur here include the California tiger salamander (*Ambystoma californiense*)(CTS) which was observed in the area in 1992, western toad (*Bufo boreas*), Pacific chorus frog (*Hyla regilla*) and bullfrog (*Rana catesbeiana*). The presence of bull frogs or predacious fish in these water bodies would limit the suitability for CTS breeding habitat.

The rangelands of the site offer suitable habitat for a number of locally occurring reptilian species. The Pacific gopher snake (*Pituophis catenifer catenifer*) and western rattlesnake (*Crotalus viridis*) were all observed during the April 2009 surveys. These same rangelands could potentially support the western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), California horned lizard (*Phrynosoma coronatum frontale*), blunt-nosed leopard lizard (*Gambelia silus*) which has been documented in Range 10E, Sections 4, 9, and 25 between 1979 and 2004, southern alligator lizard (*Elgaria multicarinatus*), San Joaquin coachwhip (*Masticophis flagellum ruddocki*) observed in Range 11E, Section 29 in 1984, common king snake (*Lampropeltis getula*), and common garter snake (*Thamnophis sirtalis*).

Both resident and migratory birds, particularly raptors and granivorous birds, are expected to utilize the field as foraging habitat. Raptors observed on the site included red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), prairie falcon (*Falco mexicanus*) American kestrel (*Falco sparverius*), and turkey vulture (Cathartes aura) Other raptors that may forage onsite include the white-tailed kite (*Elanus leucurus*), Swainson's hawk (*Buteo swainsoni*), and golden eagle (*Aquila chrysaetos*). Additional bird species observed on the site or in the vicinity included the greater roadrunner (*Geococcyx californianus*), burrowing owl (*Athene cunicularia*), Anna's hummingbird (*Calypte anna*), loggerhead shrike (*Lanius ludovicianus*), yellow-billed magpie (*Pica nuttalli*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*) including a nest on a transformer tower on the 900-acre parcel, California horned lark


LEGEND
Special status species observation
Project Site
Sources:
California Dep. of Fish & Game Natural Diversity Database
N
Nelson's antelope squirrel
California tiger salamander
Rd
FRESNO CO.
SAN BENITO CO.
Five Kilometer (3.1 mile) radius
blunt-nosed leopard lizard
California tiger salamander
mountain plover
Nelson's antelope squirrel
blunt-nosed leopard lizard
giant kangaroo rat
giant kangaroo rat
Panoche
Rd
Yturiarte
Tulare grasshopper mouse
Little Panoche Rd
mountain plover
Norton Rd
Rd
giant kangaroo rat
giant kangaroo rat
giant kangaroo rat
Recalde Rd
blunt-nosed leopard lizard
San Joaquin whipsnake
burrowing owl
giant kangaroo rat
Nelson's antelope squirrel
San Joaquin dune beetle
giant kangaroo rat
Panoche Rd
New Idria Rd
2 miles
0
2 miles
approximate scale
Live Oak Associates, Inc.
Solargen 1,000 Acre Site
Special-status Species
Date
4/09/09
Project #
1297-01
Figure #
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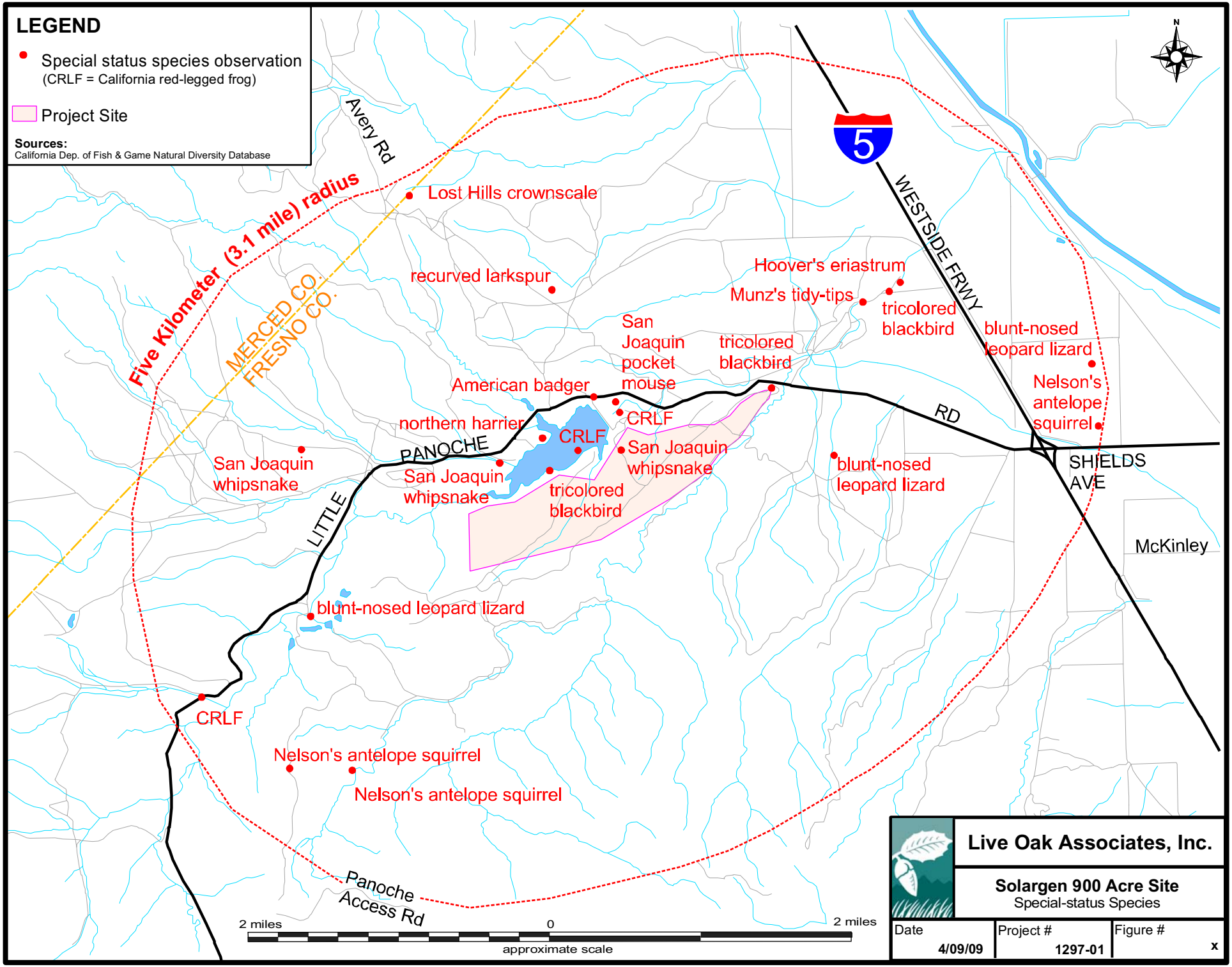
LEGEND
Special status species observation
(CRLF = California red-legged frog)
Project Site
Sources:
California Dep. of Fish & Game Natural Diversity Database
Five Kilometer (3.1 mile) radius
MERCED CO.
FRESNO CO.
Avery Rd
Lost Hills crownscale
recurved larkspur
Hoover's eriastrum
Munz's tidy-tips
tricolored blackbird
WESTSIDE FRWY
5
blunt-nosed leopard lizard
San Joaquin pocket mouse
tricolored blackbird
American badger
CRLF
northern harrier
CRLF
San Joaquin whipsnake
PANOCHE RD
San Joaquin whipsnake
San Joaquin whipsnake
tricolored blackbird
blunt-nosed leopard lizard
SHIELDS AVE
McKinley
LITTLE
blunt-nosed leopard lizard
CRLF
Nelson's antelope squirrel
Nelson's antelope squirrel
Panoche Access Rd
2 miles
0
2 miles
approximate scale
N
Live Oak Associates, Inc.
Solargen 900 Acre Site
Special-status Species
Date
4/09/09
Project #
1297-01
Figure #
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(*Eremophila alpestris actia*), European starling (*Sturnus vulgaris*), red-winged blackbird (*Agelaius phoeniceus*), tricolored blackbird (*A. tricolor*) and western meadowlark (*Sturnella neglecta*). California condors (*Gymnogyps californianus*) would also be expected to forage over the site given its proximity to the Pinnacles National Monument. A variety of owls could occur regionally including the common barn owl (*Tyto alba*) and great gray owl (*Strix nebulosa*) Shorteared owl (*Asio flammeus*)

Small mammals likely to occur on the site include the Botta's pocket gopher (*Thomonys bottae*), and western harvest mouse (*Reithrodontomys megalotis*). The San Joaquin pocket mouse (*Perognathus inornatus*), grasshopper mouse (*Onychomys torridus*), Tulare grasshopper mouse (*O. t. tularensis*) observe within Range 10S Section 20 in 1938, and deer mouse (*Peromyscus maniculatus*) would be rare additions to the site, as the site lacks thick grass and herbaceous cover. A number of California ground squirrels (*Spermophilus beecheyi*) and their burrows were observed at various areas of the site. The region supports various kangaroo rat species, and a number of precincts were observed in Range 10S, Sections: 11, 13, 14, 15, and 24, and Range 11S, Sections 18, 19 and 30, indicating the potential presence of the giant kangaroo rat (*Dipdomys ingens*). The San Joaquin antelope squirrel (*Ammospermophilus nelsoni*) has been documented in the area, and this species was observed from the roadway approximately 3.5 miles east of the site in April 2009.

Small mammals often attract predators, including reptiles and birds previously discussed. The abundance of small mammals also attracts larger mammals known to occur in the region, including the San Joaquin kit fox (*Vulpes macrotis mutica*) multiple occurrences have been made in the region and the Panoche Valley is considered one of three core habitats for the species (Figures 3 and 4), cougar (*Puma concolor*) known to occur in the region, and bobcat (*Lynx rufus*) a jaw of which was found during the April 2009 site visit. Black-tailed deer (*Odocoileus hemionus columbianus*), also occur in the region and likely graze the areas of the site from time to time.

2.2 SPECIAL STATUS PLANTS AND ANIMALS

A number of special status plants and animals occur in the vicinity of the study area. The 10,000-acre project site is located within the SE corner of Cerro Colorado, SW corner of Mercey Hot Springs, NE corner of Llanda and northern portion of Panoche U.S.G.S. 7.5 minute quadrangles, and the 900-acre project site is located within the Laguna Seca U.S.G.S. 7.5 minute quadrangle. These quadrangles and surrounding quadrangles (Chounet, Tumey Hills, Rock Springs Peak, Hernandez Reservoir, Idria, Ortigalita Peak, Ortigalita Peak NW, Hammonds Ranch, Charleston School and Dos Palos) were used in the search for special status plants and animals in the vicinity of the study area.

There are two federally listed plant species that occur in the region, the San Benito evening primrose (*Camissonia benitensis*) only known from the Idria area and San Joaquin woolythreads (*Monolopia congdonni*). In addition, there are a number of CNPS listed plants that occur regionally, several of which occur in grasslands such as those found in the Panoche Valley.

A number of special status animal species occur in the region of the proposed Farm site. Table 1 below addresses a select group of the animal species that could or do occur onsite or in the

nearby vicinity. The locations of nearby sightings of special status species have been shown in Figures 1 and 2; and figures 3 and 4 show observations of the San Joaquin kit fox within a 10-mile radius of the two study areas. Sources of information for this table included *California's Wildlife, Volumes I, II, and III* (Zeiner et al. 1988), *California Natural Diversity Data Base* (CDFG 2009), *Endangered and Threatened Wildlife and Plants* (USFWS 2009), *Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants* (CDFG 2009), and *The California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2001 and online inventory).

TABLE 1. SECLECT LIST OF SPECIAL STATUS ANIMAL SPECIES THAT OCCUR OR HAVE THE POTENTIAL TO OCCUR WITHIN THE VICINITY OF THE STUDY AREA

ANIMALS (adapted from CDFG 2009 and USFWS 2009)

Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act

Species	Status	Habitat	Occurrence in the Study Area
California Tiger Salamander (*Ambystoma californiense*)	FT, SCE	Requires vernal pools for breeding and rodent burrows in annual grasslands for refuge.	**Possible.** Stock ponds were observed in Section 4, and CTS were observed in this area in 1992. It is possible the species remains present; however, the presence of bull frogs and/or predacious fish would reduce successful breeding for the species.
Blunt-Nosed Leopard Lizard (*Gambelia silus*)	FE, CE, CP	Frequents grasslands, alkali meadows and chenopod scrub of the San Joaquin Valley from Merced south to Kern Co.	**Likely.** BNLL have been documented by the CNDDB in Sections 4, 9, and 25 between 1979 and 2004. Potentially suitable habitat occurs onsite for BNLL.
San Joaquin Antelope Ground Squirrel (*Ammospermophilus nelsoni*)	CT	Occurs in the southwest portion of the valley on dry, sparsely vegetated loamy soils.	**Possible.** SJAS were recorded by the CNDDB in Section 3, and antelope squirrels were observed approximately 3.5 miles east of the subject properties during reconnaissance surveys conducted in April 2009.
Giant Kangaroo Rat (Di*pdomys ingens*)	FE, CE	Occurs in grasslands and shrub communities on gentle slopes (less than 11%). Primarily feeds on seeds, and occasionally on green plants and insects.	**Present.** GKR create burrow systems known as "precincts" with well worn paths between burrows. They also have a propensity to store their seeds outside their burrows. Evidence of this behavior and scats of appropriate size for GKR were observed in Sections 11, 13, 14, 15, 18, 19, 24 and 30 during recon surveys in April 2006. The CNDDB lists occurrences for this species in Sections 19 and 29 in 1992 and 2004, respectively. Therefore, GKR are presumed present onsite.
San Joaquin Kit Fox (*Vulpes macrotis mutica*)	FE, CT	Frequents desert alkali scrub and annual grasslands and may forage in adjacent agricultural habitats. Utilizes enlarged (4 to 10 inches in diameter) ground squirrel burrows as denning habitat.	**Present.** Panoche Valley is known to be one of 3 core habitat areas for SJKF. Burrows of suitable size for SJKF denning and scats of appropriate size for SJKF were observed in Sections 11, 13, 14, 15, 18, 19, 24 and 30 during recon surveys in April 2006. The CNDDB lists occurrences of the species in Sections 20, 22, 23, 25, 29 and 30 between 1975 and 2006. Conversations with local residents indicate frequent sightings. Therefore, SJKF are presumed present onsite.

State Sepcies of Special Concern

Species	Status	Habitat	Occurrence in the Study Area
Burrowing Owl (*Athene cunicularia*)	CSC	Frequents open, dry annual or perennial grasslands, deserts, and scrublands characterized by low growing vegetation. This species is dependent upon burrowing mammals, most notably the California ground squirrel, for nest burrows.	**Likely.** Burrowing owls were observed along Little Panoche Road between Mercey Hot Springs and the 10,000-acre site during April 2009 recon surveys. Furthermore, BUOW were observed in 2004 in Range 11S Section 29.

Explanation of Occurrence Designations and Status Codes

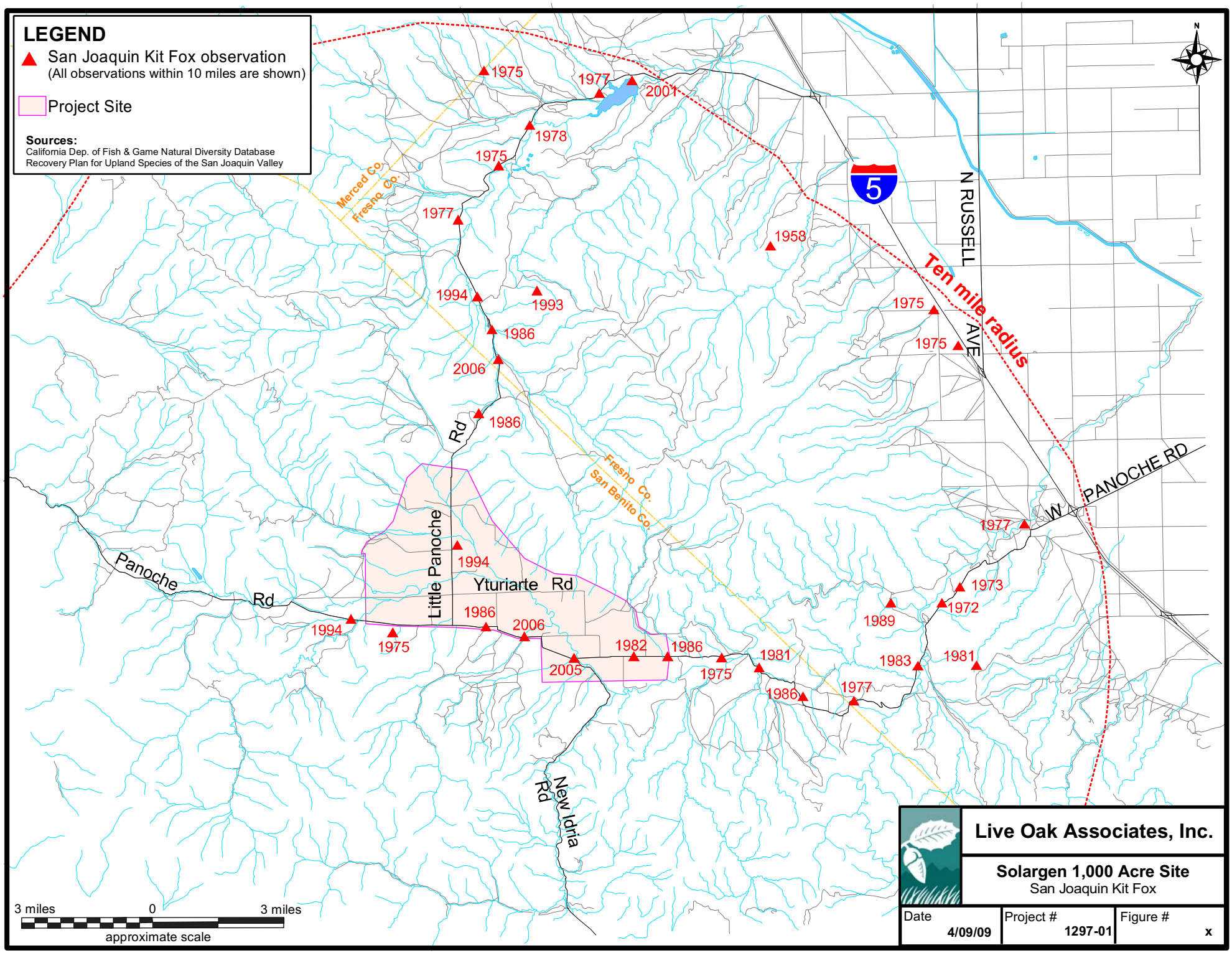
Present: Species observed on the sites at time of field surveys or during recent past.
Likely: Species known to occur in the vicinity and would likely occur onsite due to presence of like habitat.
Possible: Species not observed on the sites, but it could occur there from time to time.
Unlikely: Species not observed on the sites, and would not be expected to occur there except, perhaps, as a transient
Absent: Species not observed on the sites, and precluded from occurring there because habitat requirements not met.

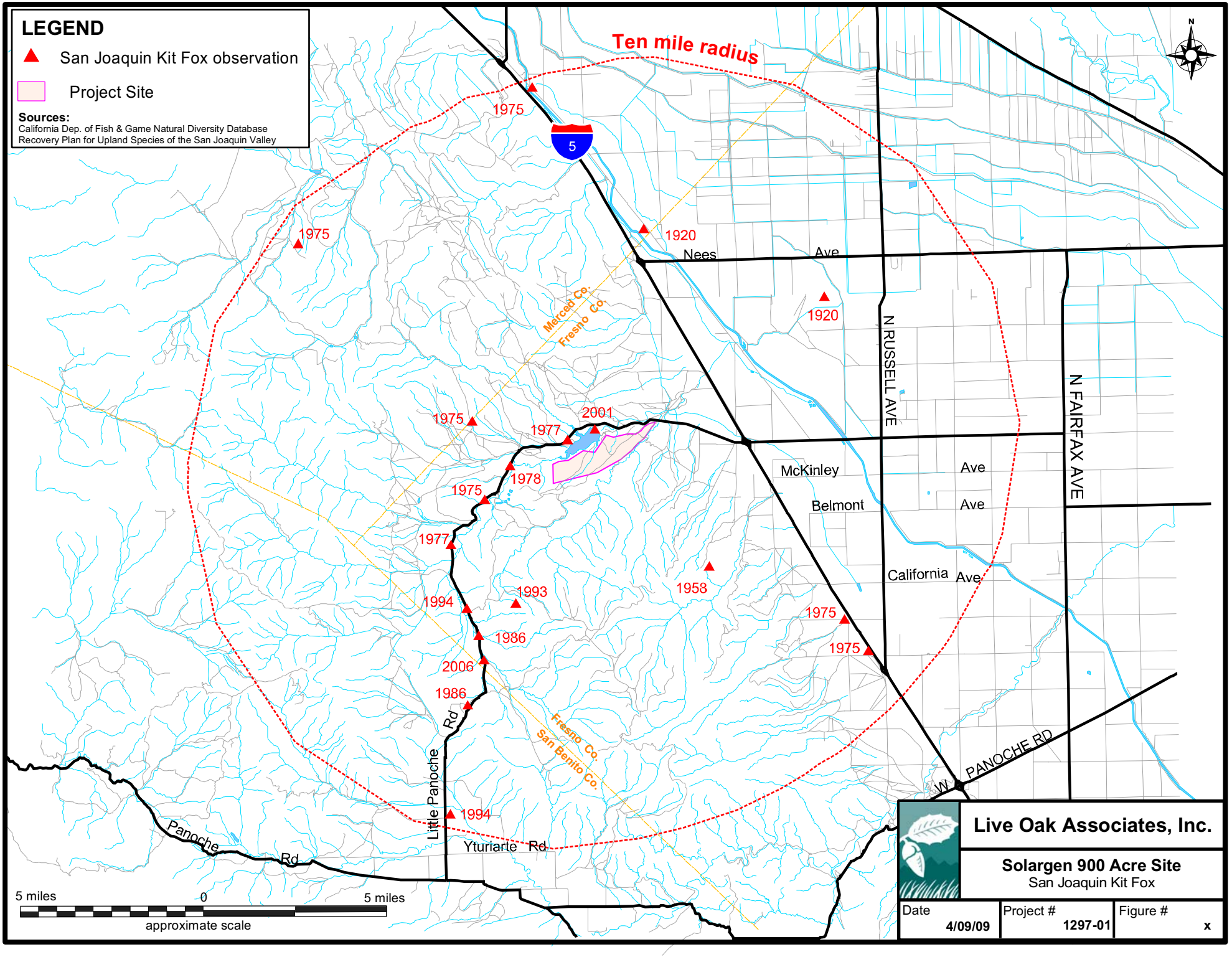
STATUS CODES

FE	Federally Endangered	CE	California Endangered
FT	Federally Threatened	CT	California Threatened
FPE	Federally Endangered (Proposed)	CR	California Rare
FC	Federal Candidate	CP	California Protected
		CSC	California Species of Special Concern
		SCE	California Candidate (Endangered)

CNPS California Native Plant Society Listings:

1A	Plants Presumed Extinct in California	3	Plants about which we need more information – a review list
1B	Plants Rare, Threatened, or Endangered in California and elsewhere	4	Plants of limited distribution – a watch list
2	Plants Rare, Threatened, or Endangered in California, but more common elsewhere		


LEGEND
San Joaquin Kit Fox observation
(All observations within 10 miles are shown)
Project Site
Sources:
California Dep. of Fish & Game Natural Diversity Database
Recovery Plan for Upland Species of the San Joaquin Valley
1975
1977
2001
1978
1975
1977
1994
1993
1986
2006
1986
1958
1975
1975
1977
1973
1972
1989
1983
1981
1981
1977
1986
1975
2005
1982
1986
2006
1994
1975
1994
Merced Co.
Fresno Co.
Fresno Co.
San Benito Co.
Ten mile radius
N RUSSELL AVE
PANOCHE RD W
Little Panoche Rd
Yturiarte Rd
Panoche Rd
New Idria Rd
5
N
3 miles
0
3 miles
approximate scale
Live Oak Associates, Inc.
Solargen 1,000 Acre Site
San Joaquin Kit Fox
Date 4/09/09
Project # 1297-01
Figure # x


LEGEND
San Joaquin Kit Fox observation
Project Site
Sources:
California Dep. of Fish & Game Natural Diversity Database
Recovery Plan for Upland Species of the San Joaquin Valley
Ten mile radius
N
5
1975
1975
1920
1920
Nees
Ave
Merced Co.
Fresno Co.
N RUSSELL AVE
N FAIRFAX AVE
2001
1977
1975
1978
1975
1977
1993
1994
1986
2006
1986
1958
1975
1975
McKinley
Ave
Belmont
Ave
California
Ave
W. PANOCHE RD
Fresno Co.
San Benito Co.
Little Panoche Rd
1994
Yturiarte Rd
Panoche Rd
5 miles
0
5 miles
approximate scale
Live Oak Associates, Inc.
Solargen 900 Acre Site
San Joaquin Kit Fox
Date
4/09/09
Project #
1297-01
Figure #
x

LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

November 24, 2009

Eric Cherniss
Vice President of Project Development
Solargen Energy, Inc.
20400 Stevens Creek Blvd., Suite 700
Cupertino, CA 95014

Subject: Late summer/early fall rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California (PN 1297-04)

Dear Eric:

At your request, Live Oak Associates, Inc. (LOA), completed focused surveys for special status plants (i.e., plants designated as endangered, threatened, or rare) on 6,200 acres of the approximately 10,000-acre Panoche Valley Solar Farm site located along Panoche Road and Little Panoche Road in San Benito County. Specifically, this survey was conducted to determine whether or not late-season-blooming rare plant species are present on the site.

Site Location and Existing Conditions

The project site occurs on the floor of Panoche Valley between the Gabilan Range to the west and the Panoche Hills to the east. The survey area is generally bounded to the west, north, and east by open space and rangelands and to the south by Yturiarte Road (Figure 1). Surrounding lands consist of rangelands used for cattle grazing.

The survey area consists of all or portions of the following: sections 3, 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 16, and 17 of township 15 south, range 10 east; and sections 18 and 19 of township 15 south, range 11 east (Figure 2). Panoche Creek, Las Aguilas Creek, and several other unnamed drainages run through the site. Soils on the site range from slightly acid to moderately alkaline. Topographically, the site is relatively flat, ranging in elevation from approximately 1300 ft. National Geodetic Vertical Datum (NGVD) along Yturiarte Road to approximately 1400 ft. NGVD along the east and west edges of the valley floor.

Target Special Status Species

The late summer/early fall rare plant surveys focused on six target species that are known to occur in the region and have habitat requirements that the site may potentially support (Table 1). These species also have late-season flowering periods (i.e., late summer to early fall), making

them easiest to identify at this time of year. None of the six target species are listed on the federal or state endangered species lists.

Table 1. Target species for the late-season rare plant surveys.

Species	CNPS Listing*	Family	Description
Crownscale (*Atriplex coronata* var. *coronata*)	CNPS 4	Chenopodiaceae	Life form: Annual herb. Habitat: Chenopod scrub, valley and foothill grasslands, and vernal pools. Occurs on alkaline soils. Blooms: March–October.
Lost Hills crownscale (*Atriplex vallicola*)	CNPS 1B	Chenopodiaceae	Life form: Annual herb. Habitat: Chenopod scrub, valley and foothill grasslands, and vernal pools. Often occurs on powdery, alkaline soils that are vernally moist. Blooms: April–August.
Big tarplant (*Blepharizonia plumosa*)	CNPS 1B	Asteraceae	Life form: Annual herb. Habitat: Valley and foothill grasslands, often in dry areas. Blooms: July–October.
Hispid bird's-beak (*Cordylanthus mollis* ssp. *hispidus*)	CNPS 1B	Scrophulariaceae	Life form: Annual herb. Habitat: Meadows and seeps, playas, and valley and foothill grasslands. Often occurs on damp, alkaline soils. Blooms: June–September.
Idria buckwheat (*Eriogonum vestitum*)	CNPS 4	Polygonaceae	Life form: Annual herb. Habitat: Valley and foothill grasslands. Blooms: April–August.
San Joaquin bluecurls (*Trichostema ovatum*)	CNPS 4	Lamiaceae	Life form: Annual herb. Habitat: Chenopod scrub and valley and foothill grasslands. Blooms: July–October.

***California Native Plant Society (CNPS) list designations**
1B: Plants Rare, Threatened, or Endangered in California and elsewhere
4: Plants of limited distribution – a watch list

Survey Methods

Prior to conducting the surveys, LOA searched the California Natural Diversity Database (CDFG 2009) and the *Inventory of Rare and Endangered Plants* (CNPS 2009) to identify the nearest known populations of the target species to the project site and to review photographs and habitat requirements of the species.

Focused special status plant species surveys were conducted by LOA botanist Neal Kramer and LOA ecologists Davinna Ohlson, Melissa Denena, Nathan Hale, Jeff Gurule, Dave Hartesveldt, Pamela Peterson, and Molly Goble. Sections 10 and 15 were surveyed for rare plants concurrent with the blunt-nosed leopard lizard surveys; these surveys were conducted August 17-19 and

August 24-26, 2009. Surveys over the remaining sections were conducted on September 14-18, September 21-25, and September 30–October 2, 2009.

In summary, the survey team walked the entire site in evenly-spaced transects, ensuring 100% visual coverage, during the species' blooming period when they would be evident and most identifiable. Emphasis was placed on areas more likely to support suitable habitat for the target species. All vascular plant species observed were recorded in a field notebook and, to the maximum extent practicable, identified to the lowest taxonomic order (Appendices A and B). This survey methodology is consistent with survey protocols outlined in the *CNPS Botanical Survey Guidelines* and the California Department of Fish and Game Resource Agency's *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities* (Appendix C).

Results

None of the target late-blooming special status species were found on any sections of the site during the August, September, and October 2009 surveys (Appendix B). Based on our findings, we conclude that these species are absent from the project site. Ground disturbance activities (e.g., grading, trenching, or drilling) occurring on the site within the next three to five years would not adversely impact these species, as they are not expected to recruit on the site within this timeframe.

Should ground disturbance activities begin more than three to five years past the date of these surveys, then the site should be resurveyed to evaluate any changes in site conditions and determine if the target species remain absent from the site.

If you have any questions regarding our findings, please contact Michele Korpos at mkorpos@loainc.com or (408) 281-5881 at your earliest convenience.

Sincerely,

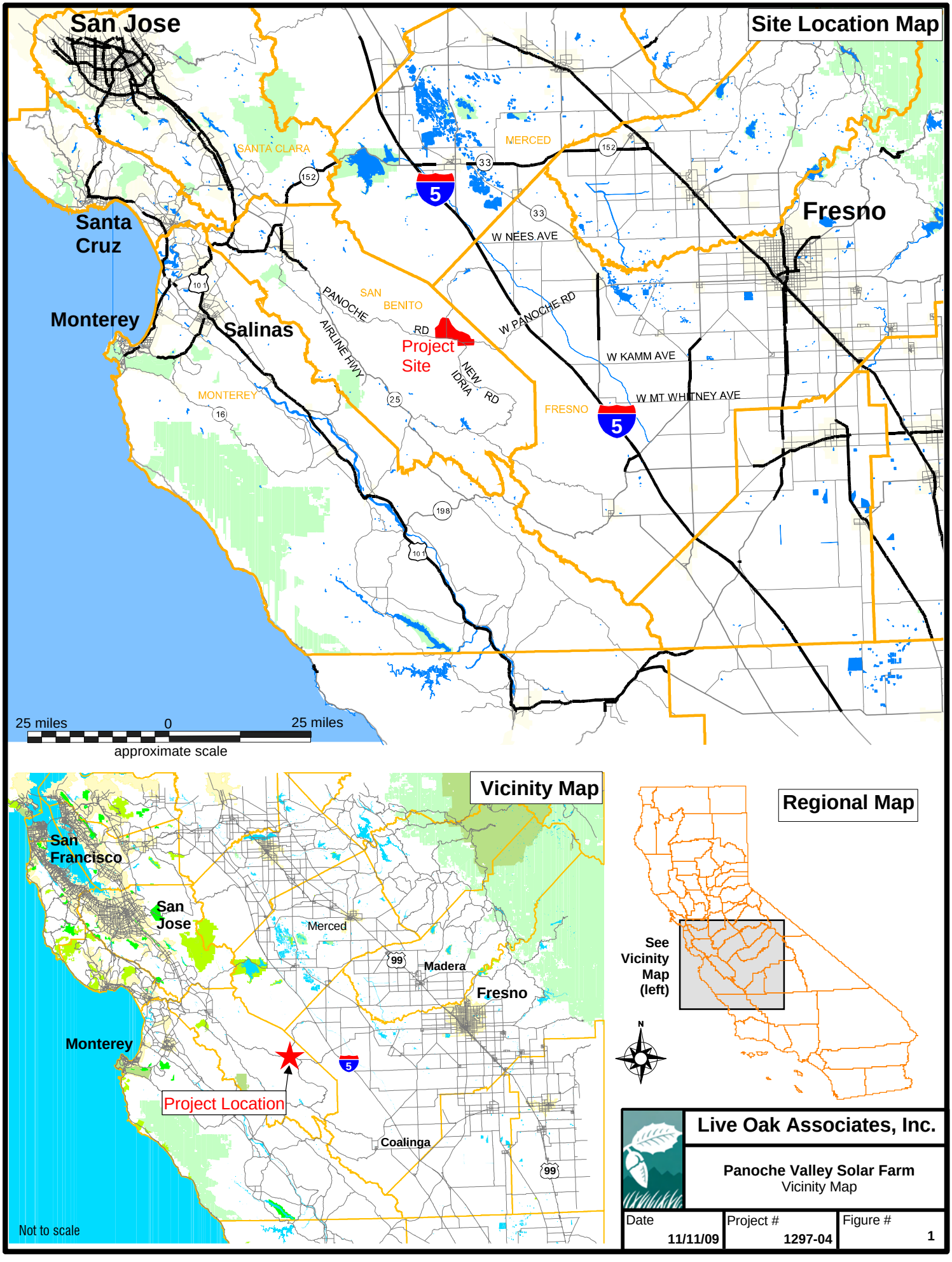
Davinna Ohlson, M.S.
Senior Project Manager
Plant/Wildlife Ecologist

Enclosures

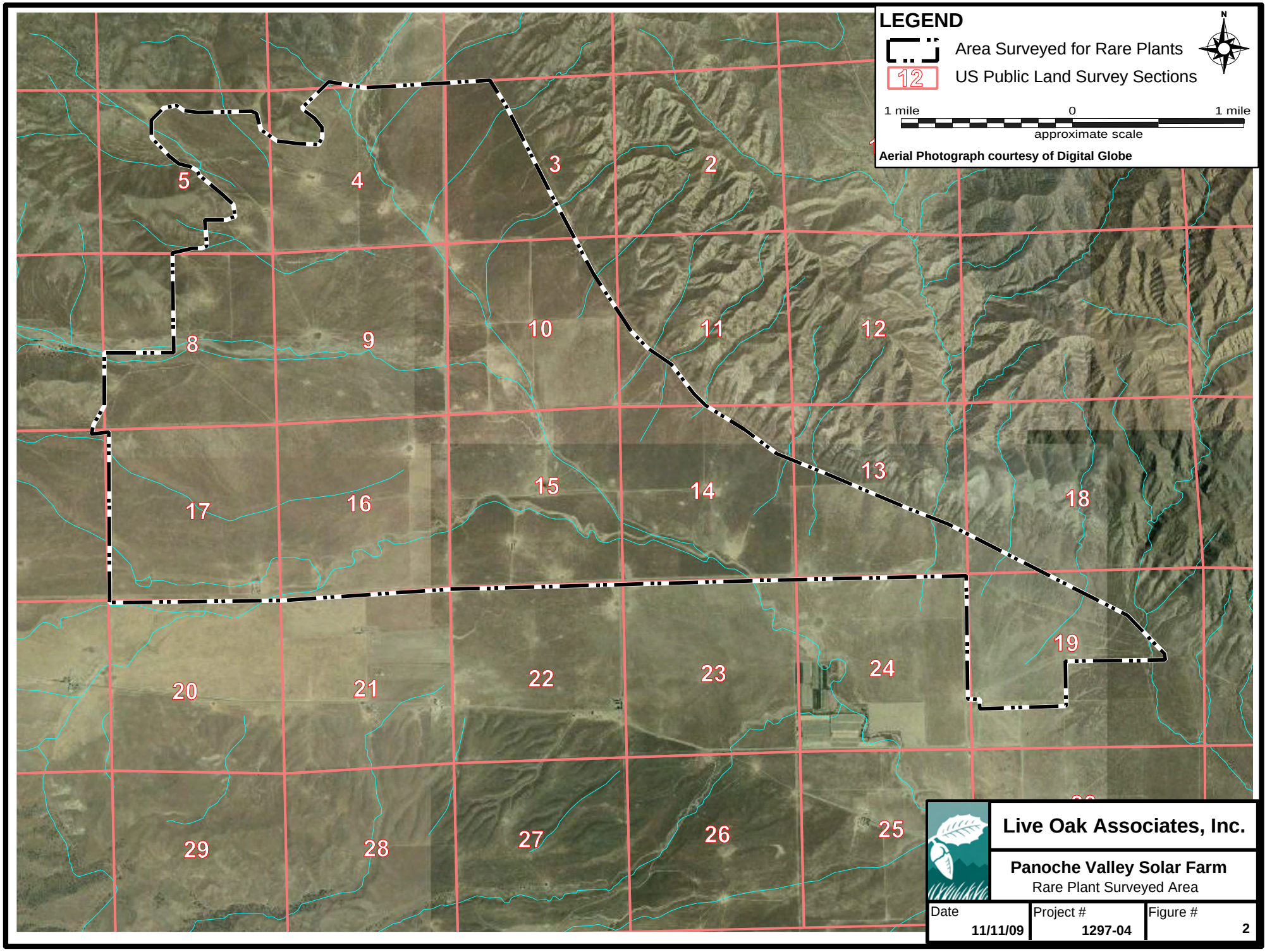
References

California Department of Fish and Game. 2009. California fish and game code. Gould Publications. Binghamton, NY.

California Native Plant Society. 2009. Inventory of Rare and Endangered Vascular Plants of California (7th Edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA.



Live Oak Associates, Inc.		
Panoche Valley Solar Farm Vicinity Map		
Date 11/11/09	Project # 1297-04	Figure # 1


LEGEND
Area Surveyed for Rare Plants
12
US Public Land Survey Sections
1 mile
0
1 mile
approximate scale
Aerial Photograph courtesy of Digital Globe
5
4
3
2
8
9
10
11
12
17
16
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14
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26
25
Live Oak Associates, Inc.
Panoche Valley Solar Farm
Rare Plant Surveyed Area
Date
11/11/09
Project #
1297-04
Figure #
2

APPENDIX A: VASCULAR PLANTS OF THE STUDY AREA

The plants species listed below were observed on the Panoche Valley solar farm site during the field survey conducted by Live Oak Associates from August through October 2009. The U.S. Fish and Wildlife Service wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland
+/- - Higher/lower end of category
NI - No investigation

Scientific Name	Common Name	Wetland Status
AMARANTHACEAE - Amaranth Family		
*Amaranthus albus**	tumbleweed, white amaranth	FACU
Atriplex fruiticulosa	ball saltbush	
Atriplex polycarpa	cattle/allscale/desert saltbush	UPL
*Salsola tragus**	Russian thistle, tumbleweed	FACU
ANACARDIACEAE - Sumac or Cashew Family		
*Schinus molle**	California/Peruvian pepper tree	UPL
APIACEAE - Carrot Family		
Lomatium sp.	common lomatium	UPL
Sanicula crassicaulis	Pacific sanicle, gamble weed	UPL
APOCYNACEAE - Dogbane Family		
Asclepias fasicularis	narrow-leaf milkweed	FAC
ARALIACEAE - Ginseng Family		
*Hedera helix**	english ivy	UPL
ASTERACEAE - Sunflower Family		
Achyrachaena mollis	blow wives	UPL
Ambrosia acanthicarpa	annual bursage	
Blepharizonia laxa	big tarweed	UPL
*Centaurea melitensis**	tocalote	UPL
Conyza canadensis	horseweed	FAC
Hemizonia kelloggii	Kellogg's tarweed	UPL
Heterotheca oregona var. rudis	inland Oregon golden aster	UPL
Holocarpha obconica	San Joaquin Tarweed	UPL
Holocarpha virgata var. virgata	virgate/pitgland tarweed	UPL
*Hypochaeris glabra**	smooth cat's ear	UPL
Isocoma menziesii var. vernonioides	coastal isocoma, coast goldenbush	FACW
*Lactuca serriola**	prickly lettuce	FAC
Lagophylla ramosissima	common hareleaf	UPL
Lasthenia californica	coast/California/common goldfields	UPL
Layia platyglossa	tidy-tips	UPL
Lessingia nemaclada	slenderstem/thread-stem lessingia	UPL
*Matricaria matricarioides**	pineapple weed	FACU

Scientific Name	Common Name	Wetland Status
Monolopia major	cupped monolopia	UPL
Psilocarphus brevissimus var. brevissimus	dwarf woolly-heads	OBL
Rafinesquia californica	California chicory	UPL
Senecio flaccidus var. douglasii	Douglas' groundsel/shrubby butterweed	UPL
*Senecio vulgaris**	common groundsel	NI*
BORAGINACEAE - Borage Family		
Amsinckia menziesii var. intermedia	common fiddleneck	UPL
Amsinckia menziesii var. menziesii	Menzies' /small-flowered fiddleneck	UPL
Amsinckia tessellata	devil's lettuce, checker fiddleneck	
Heliotropium curassavicum	seaside/salt heliotrope	OBL
Plagiobothrys acanthocarpus	adobe popcornflower	OBL
Plagiobothrys stipitatus var. ?	slender popcorn flower	OBL
BRASSICACEAE - Mustard Family		
*Capsella bursa-pastoris**	shepherd's purse	FAC-
*Cardaria draba**	heart-podded hoary cress	UPL
*Descurainia sophia**	flixweed, tansymustard	UPL
*Hirschfeldia incana**	summer mustard	UPL
Lepidium dictyotum var. dictyotum	alkali peppergrass	OBL
Lepidium nitidum var. nitidum	shining peppergrass	UPL
*Sisymbrium irio**	London rocket	UPL
*Sisymbrium orientale**	oriental mustard	UPL
Thysanocarpus curvipes	lacepod/fringe pod, ribbed fringepod	UPL
CHARACEAE - Green Algae		
Chara sp.	green algae	OBL
CONVOLVULACEAE - Morning-Glory or Bindweed Family		
*Convolvulus arvensis**	bindweed, orchard morningglory	UPL
CUCURBITACEAE - Gourod Family		
Marah fabaceus	California man-root	UPL
EPHEDRACEAE - Ephedra Family		
Ephedra californica	California ephedra, Mormon tea	UPL
EUPHORBIACEAE - Spurge Family		
Chamaesyce ocellata ssp. ocellata	Contura Creek sandmat, valley spurge	UPL
Eremocarpus setigerus	turkey mullein, dove weed	UPL
FABACEAE - Legume Family		
Astragalus gambelianus	Gambell's dwarf milkvetch	UPL
Astragalus oxyphysus	Mt. Diablo milkvetch, Diablo locoweed	UPL
Lotus wrangelianus	California lotus	UPL
Lupinus bicolor	miniature lupine, Lindley's annual lupine	UPL
Lupinus microcarpus	gully/chick lupine	UPL
Lupinus succulentus	arroyo lupine	UPL
*Medicago polymorpha**	burclover	UPL
*Melilotus indicus**	sour clover, Indian melilot	FAC
*Robinia pseudoacacia**	black locust	FAC
FAGACEAE - Oak Family		
Quercus agrifolia	coast live oak	UPL
FRANKENIACEAE - Frankenia Family		
Frankenia salina	alkali heath	FACW+
GERANIACEAE - Geranium Family		

Scientific Name	Common Name	Wetland Status
*Erodium botrys**	broad-leaved filaree	UPL
*Erodium cicutarium**	red-stemmed filaree	UPL
*Erodium moschatum**	white-stemmed filaree	UPL
JUGLANDACEAE - Walnut Family		
*Juglans hindsii**	Northern California blacck walnut	
LAMIACEAE - Mint Family		
*Marrubium vulgare**	horehound	FAC
*Marrubium vulgare**	horehound	FAC
Trichostema lanceolatum	vinegarweed	UPL
LOASACEAE - Loasa Family		
Mentzelia sp.	blazingstar	UPL
MALVACEAE - Mallow Family		
*Malva parviflora**	cheeseweed	UPL
Malvella leprosa	alkali mallow	FAC*
MORACEAE - Mulberry Family		
*Maclura pomifera**	osage orange	UPL
*Morus alba**	white/silkworm mulberry	NI
MYRTACEAE - Myrtle Family		
*Eucalyptus sp.**		UPL
NYCTAGINACEAE - Four O'Clock Family		
Mirabilis californica	wishbone bush	UPL
OLEACEAE - Olive Family		
*Olea europaea**	olive	UPL
ONAGRACEAE - Evening primrose Family		
Clarkia sp.		UPL
PAPAVERACEAE - Poppy Family		
Platystemon californicus	California cream cups	UPL
PINACEAE - Pine Family		
*Pinus sp.**	pine	
PLANTAGINACEAE - Plantain Family		
Plantago erecta	California plantain	UPL
POACEAE - Grass Family		
*Avena sp.**	wild oat	UPL
*Bromus diandrus**	ripgut brome	UPL
*Bromus hordeaceus**	soft chess	FACW-
*Bromus madritensis**	foxtail chess, red brome	UPL
*Cynodon dactylon**	bermuda grass	FAC
Distichlis spicata	saltgrass	FACW*
*Hordeum marinum ssp. gussoneanum**	Mediterranean barley	FAC
*Hordeum murinum ssp. leporinum**	barnyard/farmer's foxtail, foxtail barley	NI
Leymus triticoides	beardless/ alkali ryegrass	FAC+
Vulpia microstachys	annual fescue	UPL
*Vulpia myuros var. myuros**	rat-tail fescue	FACU*
POLYGONACEAE - Buckwheat Family		
Eriogonum angulosum	anglestem buckwheat	UPL
Eriogonum fasciculatum	California buckwheat	UPL
Eriogonum gracile var. gracile	slender woolly buckwheat	UPL
Eriogonum gracillimum	rose & white buckwheat	UPL

Scientific Name	Common Name	Wetland Status
Pterostegia drymarioides	pterostigia	UPL
*Rumex crispus**	curly dock	FACW-
PRIMULACEAE - Primrose Family		
Dodecatheon sp.	shooting star	UPL
PUNICACEAE - Pomegranate Family		
*Punica granatum**	pomegranate	NI
ROSACEAE - Rose Family		
*Malus sp.**	apple	
*Prunus dulcis**	almomd	UPL
*Rosa sp.**	rose	
RUTACEAE - Rue Family		
*Citrus sinensis**	orange	
SALICACEAE - Willow Family		
Populus fremontii ssp. fremontii	Fremont cottonwood	FACW
Salix laevigata	red willow	~NI
SOLANACEAE - Nightshade Family		
Datura stramonium?*	jimson weed	UPL
Datura wrightii	tolguacha, toluaca, sacred thorn-apple	UPL
*Nicotiana glauca**	tree tobacco	FAC
Solanum americanum	common/small flowered nightshade	FAC
Solanum umbelliferum	blue witch	UPL
TAMARICACEAE - Tamarisk Family		
*Tamarix aphylla**	athel	FACW-
THEMIDACEAE -		
Dichelostemma capitatum ssp. capitatum	blue dicks	UPL
VERBENACEAE - Vervain Family		
Verbena lasiostachys var.?	western verbena	FAC-
ZYGOPHYLLACEAE - Caltrop Family		
*Tribulus terrestris**	puncture vine	UPL

APPENDIX B: PLANTS OBSERVED ON THE SITE BY SECTION

The table below details the plant species observed on the Panoche Valley solar farm site by section during the rare plant surveys conducted by LOA from August through October 2009.

Scientific Name	Section														
	3	4	5	7	8	9	10	11	13	14	15	16	17	18E	19E
Achyrachaena mollis													X		
*Amaranthus albus**							X								X
Ambrosia acanthicarpa										X					X
Amsinckia menziesii				X					X	X			X		X
Amsinckia menziesii var. intermedia								X				X			
Amsinckia menziesii var. menziesii		X													
Amsinckia tessellata	X			X											
Asclepias fasicularis						X	X			X	X	X			
Astragalus sp.										X		X			
Astragalus gambelianus															
Astragalus oxyphysus															
Atriplex fruiticulosa		X													
Atriplex polycarpa									X						X
*Avena sp.**			X	X	X			X	X	X		X			
Blepharizonia laxa															X
*Bromus diandrus**	X			X				X				X	X		
*Bromus hordeaceus**	X	X	X	X	X	X	X	X	X	X		X	X	X	
*Bromus madritensis**	X	X	X	X	X	X	X	X	X	X		X	X		X
*Capsella bursa-pastoris**		X													
*Cardaria draba**															
*Centaurea melitensis**	X				X					X					
Chamaesyce ocellata ssp. ocellata	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Chara sp.											X		X		
*Citrus sinensis**													X		
Clarkia sp.					X										
*Convolvulus arvensis**		X				X	X	X		X	X	X	X		
Conyza canadensis													X		

Scientific Name	Section														
	3	4	5	7	8	9	10	11	13	14	15	16	17	18E	19E
*Cynodon dactylon**					X	X	X				X		X		
Datura stramonium?*															
Datura wrightii							X			X	X	X	X		
*Descurainia sophia**															
Dichelostemma capitatum ssp. capitatum															
Distichlis spicata									X	X		X			
Dodecatheon sp.					X								X		
Ephedra californica															
Eremocarpus setigerus	X		X		X	X	X		X	X	X	X		X	X
Eriogonum angulosum	X								X						X
Eriogonum fasciculatum															
Eriogonum gracile var. gracile						X									
Eriogonum gracillimum										X		X			
Erodium sp.			X		X								X		
*Erodium botrys**								X				X			
*Erodium cicutarium**									X				X		
*Erodium moschatum**									X						
*Eucalyptus sp.**		X					X				X	X			
Frankenia salina									X						
*Hedera helix**													X		
Heliotropium curassavicum										X	X	X	X		
Hemizonia kelloggii															
Heterotheca oregona var. rudis					X					X	X	X			
*Hirschfeldia incana**										X			X		
Holocarpha obconica															X
Holocarpha virgata var. virgata		X	X	X	X					X		X	X		
*Hordeum marinum ssp. gussoneanum**		X		X											
*Hordeum murinum ssp. leporinum**	X	X	X	X	X			X	X	X	X	X	X	X	X
*Hypochaeris glabra**												X			
Isocoma menziesii var. vernonioides									X	X	X				
*Juglans hindsii.**											X		X		
*Lactuca serriola**						X				X			X		
Lagophylla ramosissima					X	X				X		X			

Scientific Name	Section														
	3	4	5	7	8	9	10	11	13	14	15	16	17	18E	19E
Lasthenia californica										X					
Layia platyglossa															
Lepidium dictyotum var. dictyotum		X				X									
Lepidium nitidum var. nitidum	X	X		X	X	X	X	X	X	X		X		X	X
Lessingia nemaclada					X										
Leymus triticoides										X					
Lomatium sp.															
Lotus sp.															X
Lotus wrangelianus															
Lupinus sp.				X											
Lupinus bicolor					X	X							X		
Lupinus microcarpus					X					X					
Lupinus succulentus										X					
*Maclura pomifera**													X		
*Malus sp.**													X		
*Malva sp.**									X				X		
*Malva parviflora**															
Malvella leprosa											X				
Marah fabaceus															
*Marrubium vulgare**										X			X		
*Marrubium vulgare**															
*Matricaria matricarioides**													X		
*Medicago polymorpha**		X													
*Melilotus indicus**										X					
Mentzelia sp.															
Mirabilis californica															
Monolopia major															
*Morus alba**												X	X		
*Nicotiana glauca**												X	X		
*Olea europaea**										X					
*Pinus sp.**										X					
Plagiobothrys acanthocarpus		X													
Plagiobothrys stipitatus var. ?		X				X					X				

Scientific Name	Section														
	3	4	5	7	8	9	10	11	13	14	15	16	17	18E	19E
Plantago erecta		X			X				X	X			X		X
Platystemon californicus															
Populus fremontii ssp. fremontii															
*Prunus dulcis**										X					
Psilocarphus brevissimus var. brevissimus		X				X									
Pterostegia drymarioides															
*Punica granatum**										X					
Quercus agrifolia													X		
Rafinesquia californica															
*Robinia pseudoacacia**										X					
*Rosa sp.**													X		
*Rumex crispus**															
Salix laevigata											X				
*Salsola tragus**	X								X	X				X	X
Sanicula crassicaulis					X										
*Schinus molle**										X			X		
Senecio flaccidus var. douglasii					X	X						X			
*Senecio vulgaris**															
*Sisymbrium sp**								X							
*Sisymbrium irio**		X								X		X			
*Sisymbrium orientale**										X					
Solanum americanum									X						
Solanum umbelliferum			X			X									
*Tamarix aphylla**										X	X				
Thysanocarpus curvipes															
*Tribulus terrestris**							X								
Trichostema lanceolatum	X	X	X		X	X	X								
Verbena lasiostachys var.													X		
Vulpia microstachys	X	X	X	X	X	X						X	X	X	X
*Vulpia myuros var. myuros**	x	x		X	X		X	X		X		X			

APPENDIX B

CALIFORNIA NATIVE PLANT SOCIETY BOTANICAL SURVEY GUIDELINES
&
GUIDELINES FOR ASSESSING THE EFFECTS OF PROPOSED PROJECT ON RARE, THREATENED AND ENDANGERED PLANTS AND NATURAL COMMUNITIES BY THE RESOURCE AGENCY OF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

CNPS Botanical Survey Guidelines

(from CNPS *Inventory*, 6th Edition, 2001)

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how surveys should be conducted, and what information should be contained in the survey report. The California Native Plant Society recommends that lead agencies not accept the results of surveys unless they are conducted and reported according to these guidelines.

1. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all botanical resources, including special status plants (rare, threatened, and endangered plants) and plant (vegetation) communities. Special status plants are not limited to those that have been listed by state and federal agencies but include any plants that, based on all available data, can be shown to be rare, threatened, or endangered under the following definitions:

A species, subspecies, or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.[1]

Rare plant (vegetation) communities are those communities that are of highly limited distribution. These communities may or may not contain special status plants. The most current version of the California Natural Diversity Database's *List of California Terrestrial Natural Communities*[2] should be used as a guide to the names and status of communities.

Consistent with the California Native Plant Society's goal of preserving plant biodiversity on a regional and local scale, and with California Environmental Quality Act environmental impact assessment criteria[3], surveys should also assess impacts to locally significant plants. Both plants and plant communities can be considered significant if their local occurrence is on the outer limits of known distribution, a range extension, a rediscovery, or rare or uncommon in a local context (such as within a county or region). Lead agencies should address impacts to these locally unique botanical resources regardless of their status elsewhere in the state.

2. Botanical surveys must be conducted to determine if, or to the extent that, special status or locally significant plants and plant communities will be affected by a proposed project when any natural vegetation occurs on the site and the project has the potential for direct or indirect effects on vegetation.

3. Those conducting botanical surveys must possess the following qualifications:

a. Experience conducting floristic field surveys;
b. Knowledge of plant taxonomy and plant community ecology and classification;
c. Familiarity with the plants of the area, including special status and locally significant plants;
d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
e. Experience with analyzing impacts of a project on native plants and communities.

4. Botanical surveys should be conducted in a manner that will locate any special status or locally significant plants or plant communities that may be present. Specifically, botanical surveys should be:

a. Conducted in the field at the proper times of year when special status and locally significant plants are both evident and identifiable. When special status plants are known to occur in the type(s) of habitat present in the project area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the plants are identifiable at the time of survey.
b. Floristic in nature. A floristic survey requires that every plant observed be identified to species, subspecies, or variety as applicable. In order to properly characterize the site, a complete list of plants observed on the site shall be included in every botanical survey report. In addition, a sufficient number of visits spaced

throughout the growing season is necessary to prepare an accurate inventory of all plants that exist on the site. The number of visits and the timing between visits must be determined by geographic location, the plant communities present, and the weather patterns of the year(s) in which the surveys are conducted.

c. Conducted in a manner that is consistent with conservation ethics and accepted plant collection and documentation techniques[4,5]. Collections (voucher specimens) of special status and locally significant plants should be made, unless such actions would jeopardize the continued existence of the population. A single sheet should be collected and deposited at a recognized public herbarium for future reference. All collections shall be made in accordance with applicable state and federal permit requirements. Photography may be used to document plant identification only when the population cannot withstand collection of voucher specimens.
d. Conducted using systematic field techniques in all habitats of the site to ensure a thorough coverage of potential impact areas. All habitats within the project site must be surveyed thoroughly in order to properly inventory and document the plants present. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity.
e. Well documented. When a special status plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form, accompanied by a copy of the appropriate portion of a 7.5-minute topographic map with the occurrence mapped, shall be completed, included within the survey report, and separately submitted to the California Natural Diversity Database. Population boundaries should be mapped as accurately as possible. The number of individuals in each population should be counted or estimated, as appropriate.

5. Complete reports of botanical surveys shall be included with all environmental assessment documents, including Negative Declarations and Mitigated Negative Declarations, Timber Harvesting Plans, Environmental Impact Reports, and Environmental Impact Statements. Survey reports shall contain the following information:

a. Project location and description, including:
    1. A detailed map of the location and footprint of the proposed project.
    2. A detailed description of the proposed project, including one-time activities and ongoing activities that may affect botanical resources.
    3. A description of the general biological setting of the project area.
b. Methods, including:
    1. Survey methods for each of the habitats present, and rationale for the methods used.
    2. Description of reference site(s) visited and phenological development of the target special status plants, with an assessment of any conditions differing from the project site that may affect their identification.
    3. Dates of surveys and rationale for timing and intervals; names of personnel conducting the surveys; and total hours spent in the field for each surveyor on each date.
    4. Location of deposited voucher specimens and herbaria visited.
c. Results, including:
    1. A description and map of the vegetation communities on the project site. The current standard for vegetation classification, *A Manual of California Vegetation*[6], should be used as a basis for the habitat descriptions and the vegetation map. If another vegetation classification system is used, the report must reference the system and provide the reason for its use.
    2. A description of the phenology of each of the plant communities at the time of each survey date.
    3. A list of all plants observed on the project site using accepted scientific nomenclature, along with any special status designation. The reference(s) used for scientific nomenclature shall be cited.
    4. Written description and detailed map(s) showing the location of each special status or locally significant plant found, the size of each population, and method used to estimate or census the population.
    5. Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms and accompanying maps.
d. Discussion, including:
    1. Any factors that may have affected the results of the surveys (e.g., drought, human disturbance, recent fire).
    2. Discussion of any special local or range-wide significance of any plant population or community on the site.
    3. An assessment of potential impacts. This shall include a map showing the distribution of special status and locally significant plants and communities on the site in relation to the proposed activities. Direct, indirect, and cumulative impacts to the plants and communities shall be discussed.
    4. Recommended measures to avoid and/or minimize direct, indirect, and cumulative impacts.

e. References cited and persons contacted.
f. Qualifications of field personnel including any special experience with the habitats and special status plants present on the site.

3.3.2 References Cited

[1] California Environmental Quality Act Guidelines, §15065 and §15380.

[2] List of California Terrestrial Natural Communities. California Department of Fish and Game Natural Diversity Database. Sacramento, CA.

[3] California Environmental Quality Act Guidelines, Appendix G (Initial Study Environmental Checklist).

[4] Collecting Guidelines and Documentation Techniques. California Native Plant Society Policy (adopted March 4, 1995).

[5] Ferren, W.R., Jr., D.L. Magney, and T.A. Sholars. 1995. The Future of California Floristics and Systematics: Collecting Guidelines and Documentation Techniques. *Madroño* 42(2):197-210.

[6] Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, CA. 471 pp.

GUIDELINES FOR CONDUCTING RESEARCH ON RARE, THREATENED AND ENDANGERED PLANTS AND PLANT COMMUNITIES

August 1997

The Department of Fish and Game recognizes the importance of research in promoting the conservation, appreciation, and understanding of California's rare, threatened, and endangered plants and plant communities. Under Section 1907(a) and Section 2081(a) of the Fish and Game Code, the Department may authorize, through permits and Memoranda of Understanding, the take and possession of State-listed species for scientific, educational, and management purposes. The Department's Species Conservation and Recovery Program (SCARP) handles this permitting process for State-listed plant species. The Research Permit is typically the vehicle by which SCARP will authorize research on these species. To apply for a permit, use the **Proposal Format for Research Projects involving State-Listed Plants**, below.

The following information is intended to guide you in planning research on State-listed plant species.

1. The Department generally will not authorize collection of more than 5% of the seed or vegetative growth produced by any population of a listed species during any given year. In your proposal, please justify the amount you would like to collect.

2. Moving plants, seeds, or pollen from one location or population of the plant to another is generally discouraged, unless it is part of an overall recovery program, because of the possibility of genetic contamination of local natural populations. Proposals involving such movement must include justification of why this design is necessary and must address the possibility or likelihood of contamination. Methods to prevent any possible genetic contamination should be discussed.

3. If your research will include any reintroduction activities, the following criteria must be met: (a) sites chosen for reintroduction must have permanent protection in the event the reintroduction succeeds, and (b) the Investigator(s) must agree to monitor for a period that is long enough to assess the success of the reintroduction (we generally recommend seven years). Before planning a reintroduction, you should consider and include in your proposal the following factors: habitat suitability, probability of success, potential genetic contamination, and long-term protection and management needs (including funding sources).

4. Research should be conducted in a manner that is consistent with conservation ethics. Collections of voucher specimens of rare or suspected rare species should be made only when such actions will not jeopardize the continued existence of the population and in accordance with applicable State and Federal permit regulations, and generally are not needed from sites which have already been vouchered. Voucher specimens should be deposited at recognized public herbaria for future reference. Photography should be used to document plant identification and habitat whenever possible, but especially when the population cannot withstand collection of voucher specimens. The Investigators should take all precautions to minimize damage to rare species, the associated soil, and vegetation during field work.

5. Principal Investigators should possess the following qualifications:

    a. Experience as a botanical field investigator with plant identification skills and experience in experimental design, field methods, plant ecology, and at least a rudimentary knowledge of population genetics;

    b. Familiarity with the flora and fauna of the area, including rare species; and

    c. Familiarity with the appropriate State and Federal statutes related to rare plants and plant collecting.

6. Any unused seed collected from a State-listed species should be deposited at Rancho Santa Ana Botanic Garden or another facility which has the expertise and equipment necessary for seed storage, under direct arrangement with that facility and with Department approval. Research permits are issued only for scientific research projects. If your project is related to a mitigation effort, contact the Department regarding a 2081(b) incidental take permit.

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

PROTOCOL-LEVEL DRY SEASON BRANCHIOPOD SURVEY RESULTS 90-DAY REPORT PANOCHE VALLEY SOLAR FARM SAN BENITO COUNTY, CALIFORNIA (Tracking Number 81440-2010-CPA-0023)

Prepared by:

LIVE OAK ASSOCIATES, INC.

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January 14, 2010 PN 1297-06b

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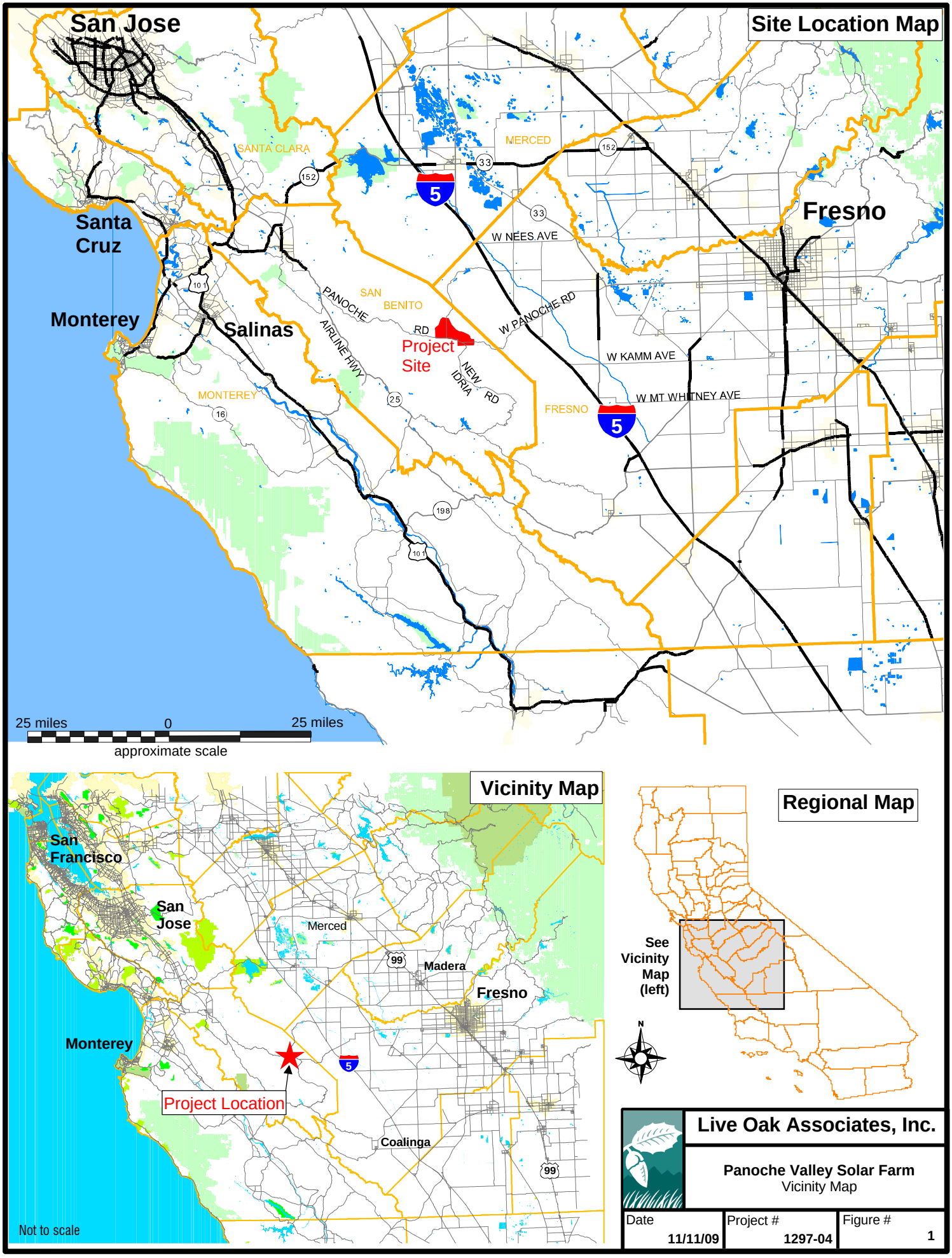
1.0 INTRODUCTION AND SITE DESCRIPTION

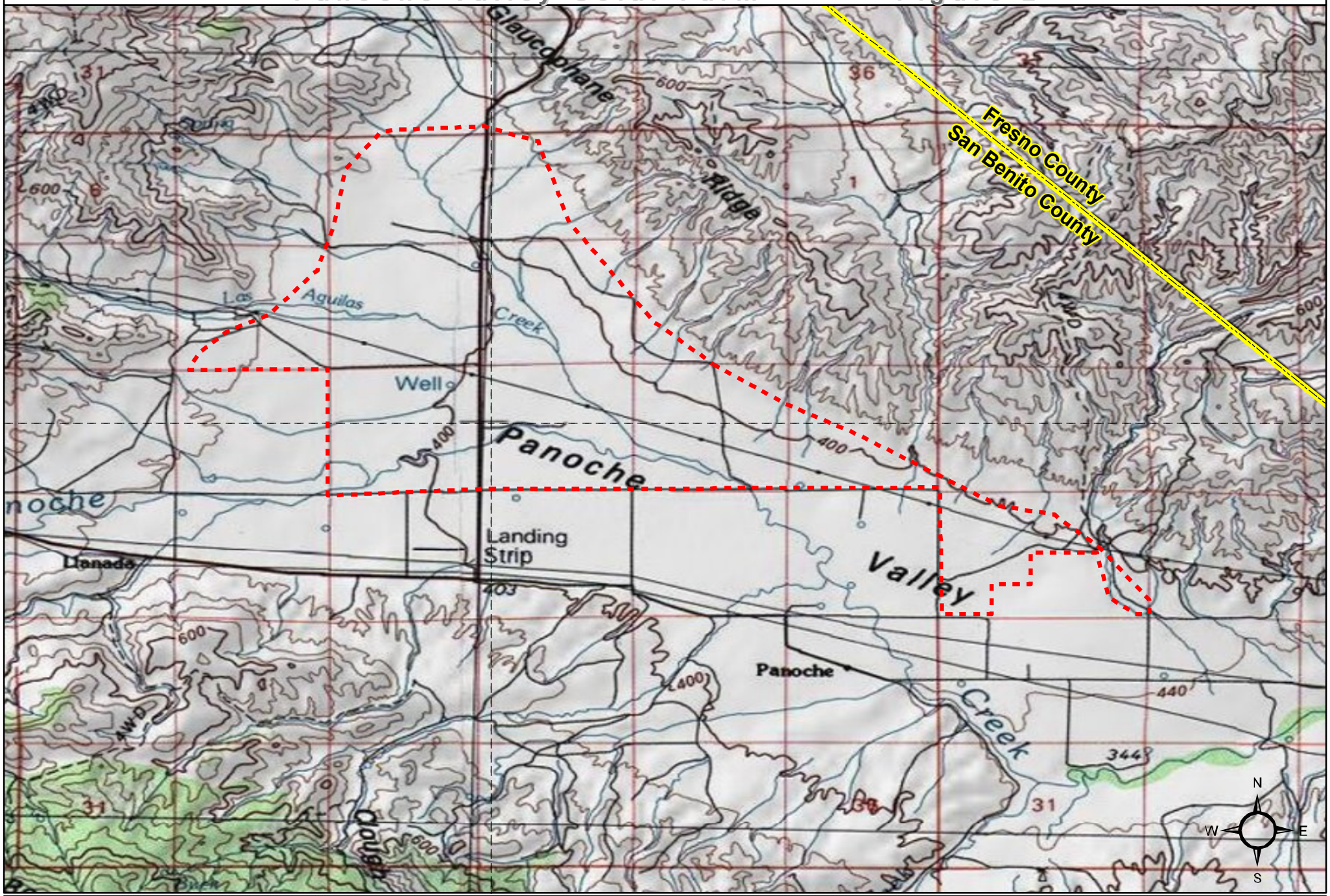
Protocol-level wet-season and dry season branchiopod surveys were conducted by Live Oak Associates, Inc. (LOA) on the Panoche Valley Solar Farm (PVSF) project site in San Benito County, California. Surveys consisted of protocol level wet season sampling in 2009/2010, the results of which were reported to the U.S. Fish and Wildlife Service (USFWS) Ventura office in a report titled *Protocol-Level Dry Season Branchiopod Survey Results 90-Day Report, Panoche Valley Solar Farm, San Benito County, California* (LOA 2010) and protocol level dry season sampling in 2010. The following report serves as the 90-day Report of the dry season surveys.

The site or study area consists of approximately 4,885-acres, located in Panoche Valley approximately 15 miles west of Interstate 5 and six miles south of Mercey Hot Springs near the intersection of Panoche Road and Little Panoche Road (Figure 1). The site can be found on the Cerro Colorado, Mercey Hot Springs, Llanada, and Panoche, California U.S.G.S quadrangles, in Sections 3-4, 8-11, and 13-16, Township 15 South, Range 10 East and Section 19, Township 15 South, Range 11 East (Figure 2). All the parcels within the study area are used for cattle grazing. The site is surrounded by rangeland and bordered to the west by the Gabilan Range and to the east by the Panoche Hills. A number of drainages and creeks are present in the area including the Panoche and Las Aguilas Creeks. The portion of the Valley associated with the proposed project ranges in elevation from approximately 1200 feet National Geodetic Vertical Datum (NGVD) to approximately 1490 feet NGVD.

Thirteen soil types from nine soil series were identified on the project site. The Riverwash soil type is the only soil considered hydric. This soil type is considered hydric due to frequent flooding for long durations or very long durations during the growing season. Riverwash consists of mixed water-washed sand and gravel, occurs along streams or rivers and is often flooded during storm events. Within the study area, Riverwash soils are associated with Panoche Creek and portions of Las Aguilas Creek. The Panoche Creek channel was not considered potential habitat for fairy shrimp or tadpole shrimp due to high flows that periodically scour the creek channel. Ponded areas that were sampled consisted primarily of two types; 1) Hard-packed depressions associated with ranch roads and cattle troughs which were extremely ruderal in nature and were repeatedly disturbed by vehicle traffic and/or cattle, and 2) Natural and artificial


Site Location Map
San Jose
Santa Cruz
Monterey
Salinas
Fresno
SANTA CLARA
MERCED
MONTEREY
FRESNO
SAN BENITO
PANOCHE RD
AIRLINE HWY
NEW IDRIA RD
W NEES AVE
W PANOCHE RD
W KAMM AVE
W MT WHITNEY AVE
Project Site
5
152
33
101
25
16
198
25 miles
0
25 miles
approximate scale
Vicinity Map
San Francisco
San Jose
Merced
Madera
Fresno
Monterey
Coalinga
99
Project Location
Not to scale
Regional Map
See Vicinity Map (left)
N
Live Oak Associates, Inc.
Panoche Valley Solar Farm
Vicinity Map
Date
11/11/09
Project #
1297-04
Figure #
1

Panoche Valley Solar Farm Figure 2



County Boundary Study Area Boundary USGS Quads: Cerro Colorado, Mercey Hot Springs, Panoche, Llanada

POWER ENGINEERS

R:\117257_Ponoche\DD\GIS\Applications\QuadMap_Print Date: 11/11/2009

1:63,360 1 inch=1 mile 0 1 2 Miles

Solargen Energy

depressions within natural swales. Annual precipitation in the general vicinity of the site is highly variable from year to year. Annual rainfall ranges between 9 and 13 inches, almost 85% of which falls between October and March. During drought years, precipitation totals may only reach 5 inches per year. Storm-water infiltrates the soils of the site, but when field capacity has been reached, gravitational water flows into the creeks and drainages.

2.0 METHODS

In order to determine the presence or absence of shrimp species on the PVSF project site, LOA conducted protocol level wet season branchiopod surveys in the winter and spring of 2009/2010 and dry season surveys on September 27 – 30, 2010. All surveys were conducted in accordance with the *Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Brachiopods* (USFWS 1996). LOA was authorized to initiate dry season branchiopod surveys by David Pereksta with the USFWS on September 14, 2010 (Appendix A).

2.1 Soil Collection

On September 27 – 30, 2010, Jeff Gurule (TE-168924-0) with the assistance of Geoffrey Cline (an un-permitted LOA biologist) conducted the dry season soil collection. Soil samples were collected by Mr. Gurule and data was recorded in the field by Mr. Cline on USFWS approved dry season data sheets. The completed dry season data sheets are presented in Appendix D.

Prior to the onset of the 2010/2011 rainy season, soils from 117 seasonal pools, stock ponds, and puddles were collected. Approximately one liter volume of the top one to three centimeters of sediment was collected from ten sampling locations within each pond. Upon completion of the soil collection, soil was properly stored and transferred to Christopher Rogers of Kansas Biological Survey for cyst analysis.

2.2 Soil Analysis

The soil analysis methods and results were prepared in a separate report authored by Mr. Rogers. This report is presented in Appendix B.

2.3 USFWS Reporting and Voucher Specimen

The USFWS requires that a 90-day report be submitted to the appropriate field office (Sacramento USFWS in this case) following the completion of protocol-level branchiopod surveys. Additionally, the USFWS requires that a "Notice of Presence" be submitted upon identifying a federally listed branchiopod species from the project site authorized for sampling

within ten working days of the finding. It is also required that a California Natural Diversity Data Base (CNDDB) field survey form be submitted to CDFG for listed species observed on site.

Any federally listed branchiopods collected during the protocol-level surveys must be submitted as voucher specimens to the California Academy of Sciences (CAS) or the Natural Museum of Los Angeles County (LACM). All specimens have to be preserved and submitted according to the CAS or LACM strict standards.

3.0 RESULTS

3.1 Dry Season Sampling

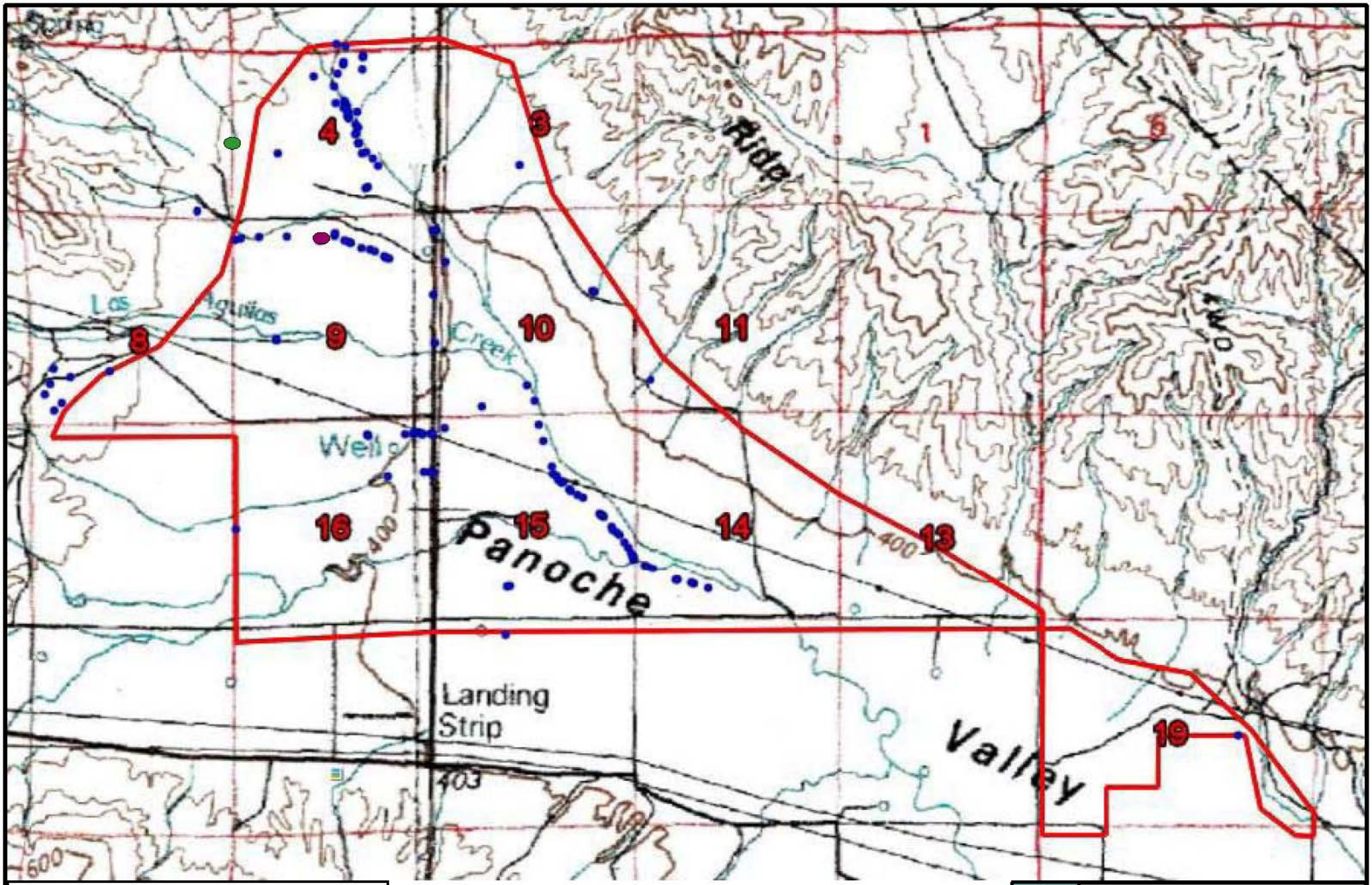
A total of 128 pools met the criteria for inundation in 2009/2010 and were sampled during the wet season for branchiopod species (Figure 3). Of the 128 pools sampled during the wet season 117 pools were sampled during the dry season survey. The discrepancy in the sampling numbers is due to separate pools becoming hydrologically connected as the wet season advanced, pools associated with cattle water troughs remaining wet throughout the year due to perennial runoff, and one pool associated with a cattle trough buried by ranchers in order to berm up the deepening depression around the cattle trough to allow cattle easy access to the water. As previously reported, the wet season survey found only one pool (Pool 12) experiencing an Anostracan hatch; with only one Anostracan species, the Federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*), detected. The dry season sampling effort found *Branchinecta* cysts in Pool 12 and Pool 13, which lies immediately down gradient from Pool 12. Therefore, it is assumed that the *Branchinecta* cysts were of the species *Branchinecta lynchi* since this species was the only Anostrocan species identified during the wet season surveys and the proximity of Pool 13 and Pool 12.

Tadpole shrimp (*lepiduris packerdi*) cysts were not detected in any of the soil samples. Pool coordinates are presented in Appendix C and photographs of the site, with photo specific information, are located in Appendix D.

3.2 USFWS Reporting and Voucher Specimen

This report serves as the dry season branchiopod 90-day report for the PVSF project site. Notification of the presence of the Federally Threatened *Branchinecta lynchi* was sent to Christopher Diel at the Ventura, CA Branch of the USFWS via an email on March 24, 2010 during the wet season survey.

As required by the USFWS, a CNDDB form was submitted to CDFG in order to document the presence of *Branchinecta lynchi* found during the 2009/2010 wet season surveys.



LEGEND

- Sampled Pools
- *Branchinecta lynchi*
- *Ambystoma californiense*
- Approximate Project Boundary

N

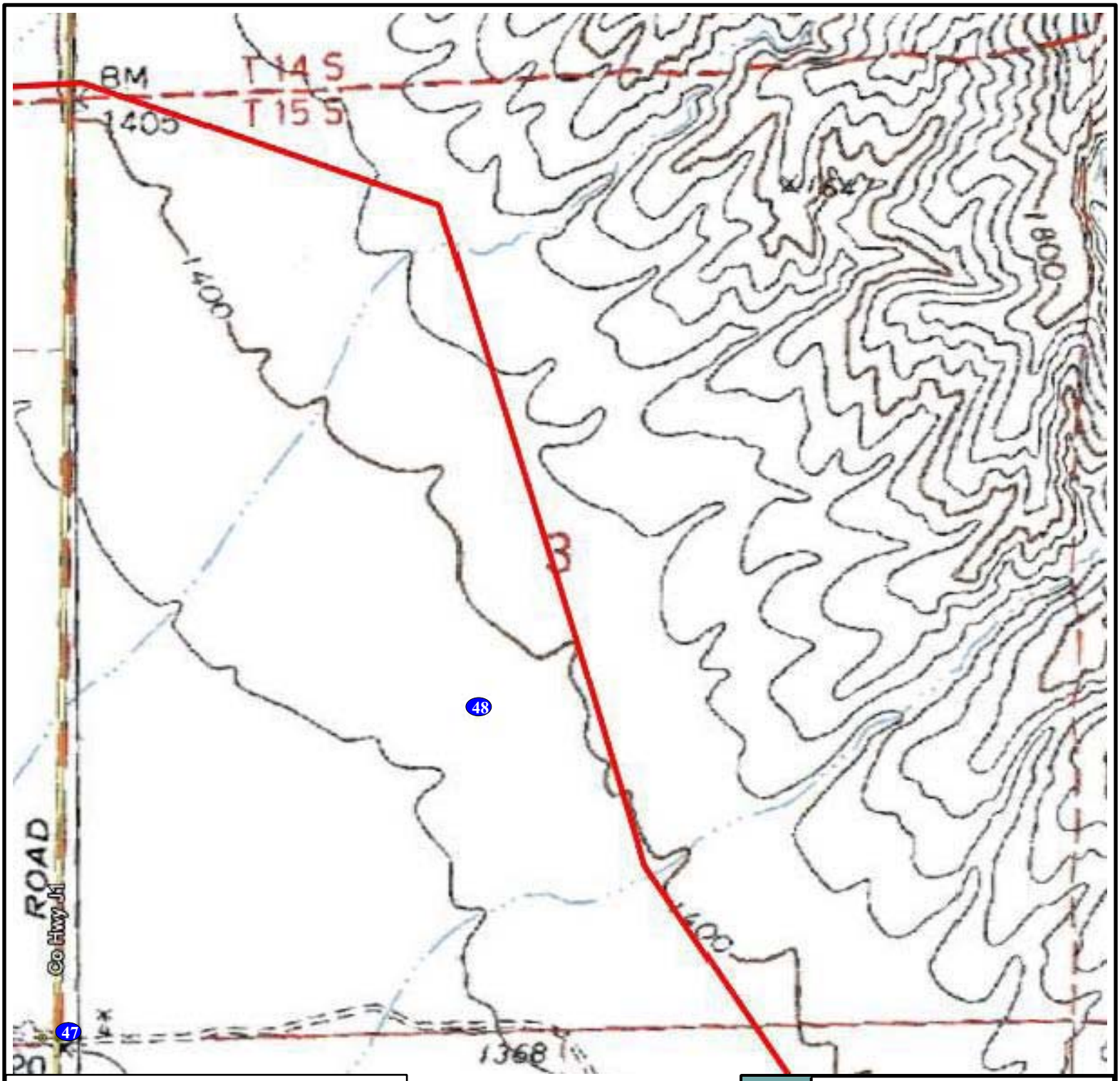
1 Mile 0 1 Mile

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Overview Map

Date	Project #	Figure #
7/8/10	1297-06	3 - Overview



LEGEND

- 68 Sampled Pool
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

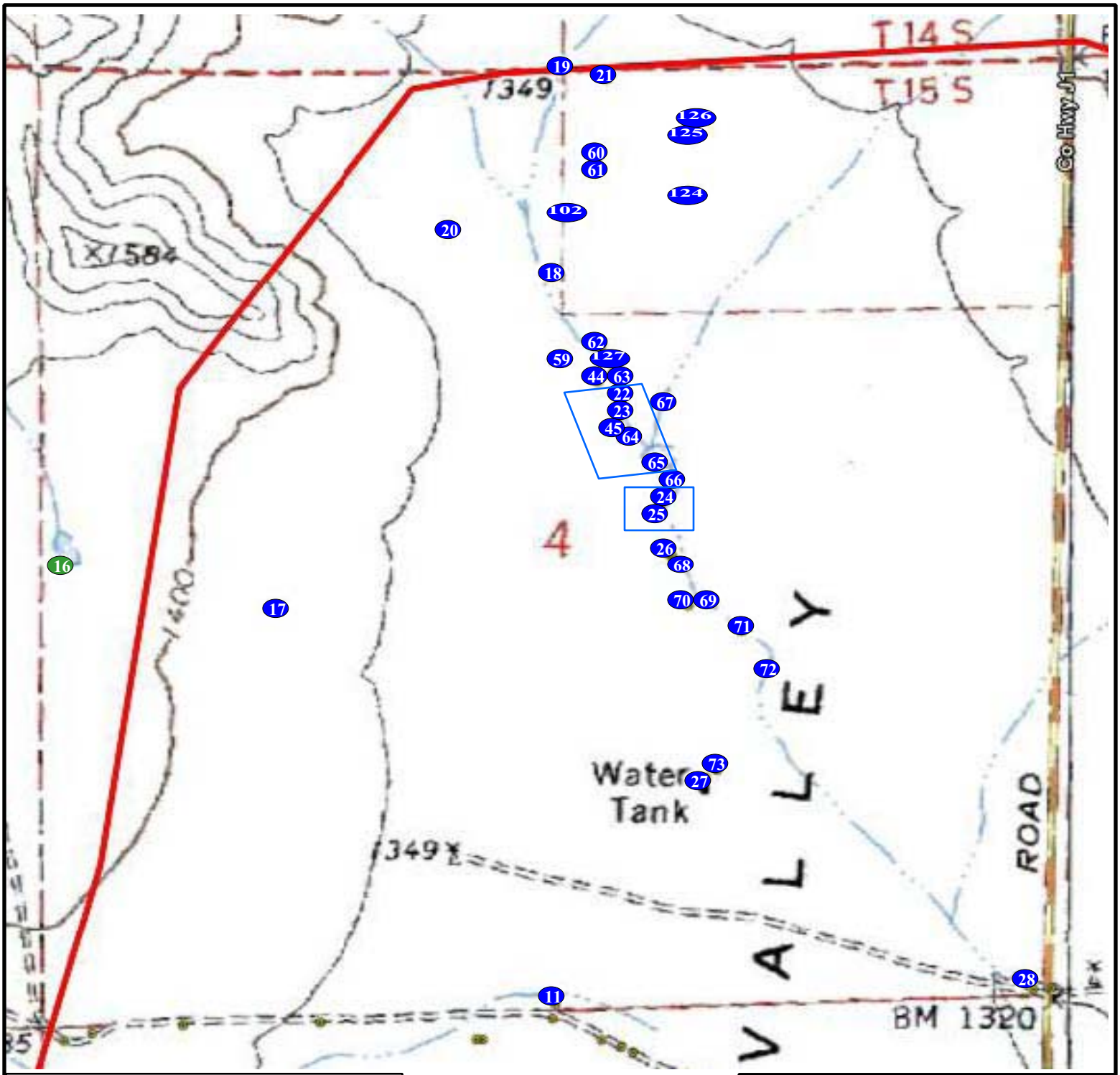
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 3

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 3



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

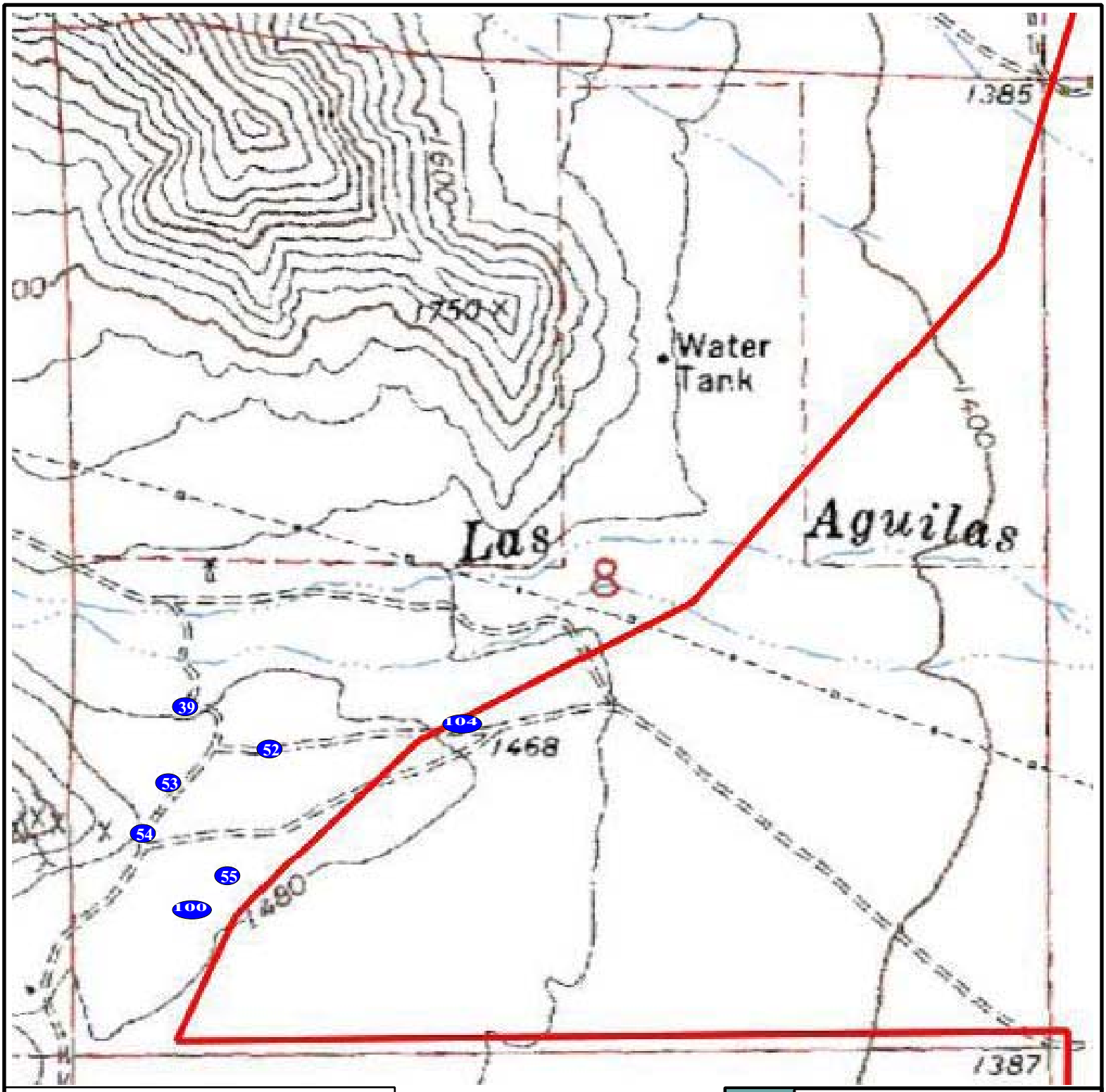
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 4

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 4



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

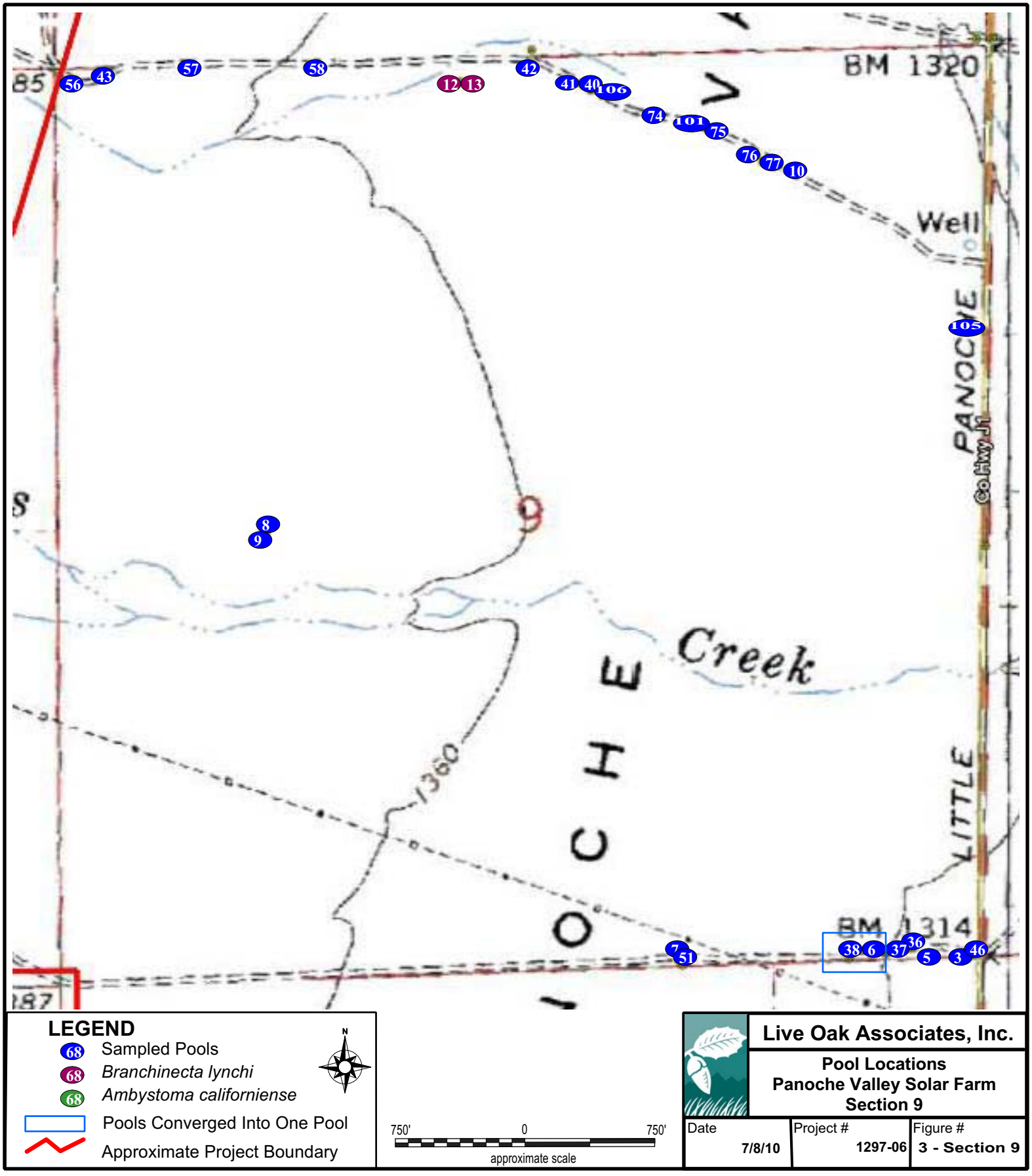
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 8

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 8



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

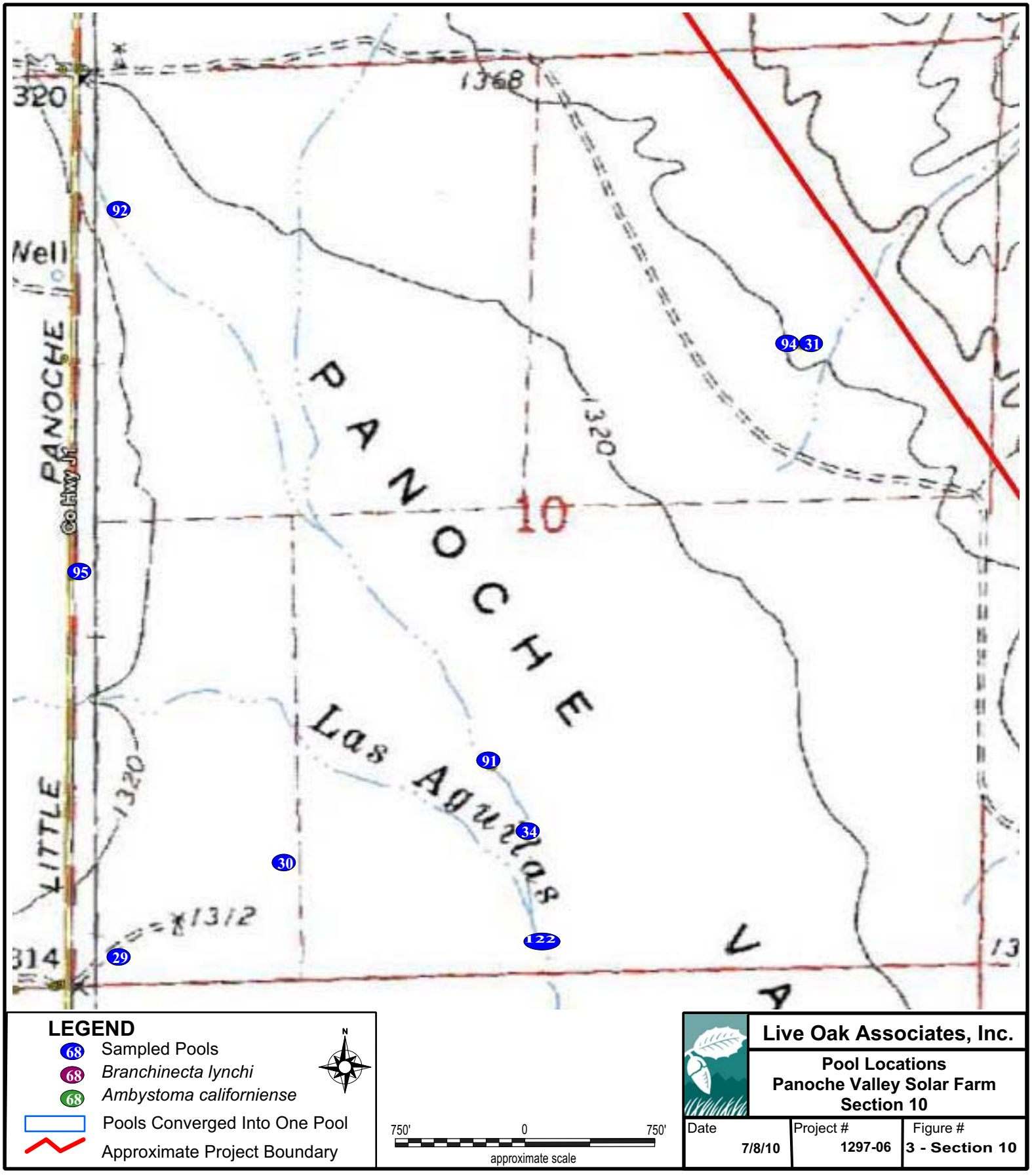
N

750' 0 750'
approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 9

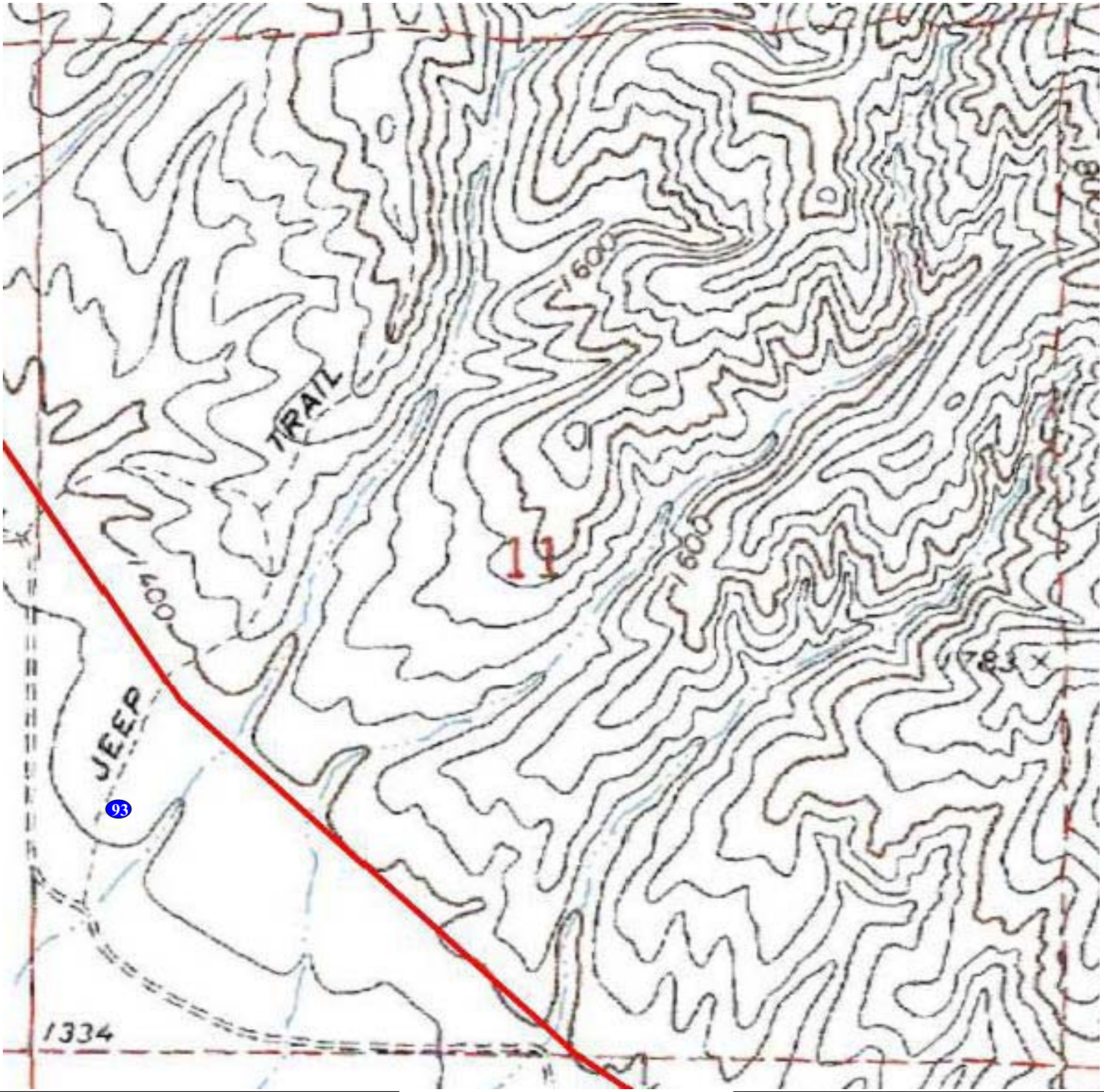
Date	Project #	Figure #
7/8/10	1297-06	3 - Section 9



Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 10

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 10



LEGEND

- 68 Sampled Pool
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

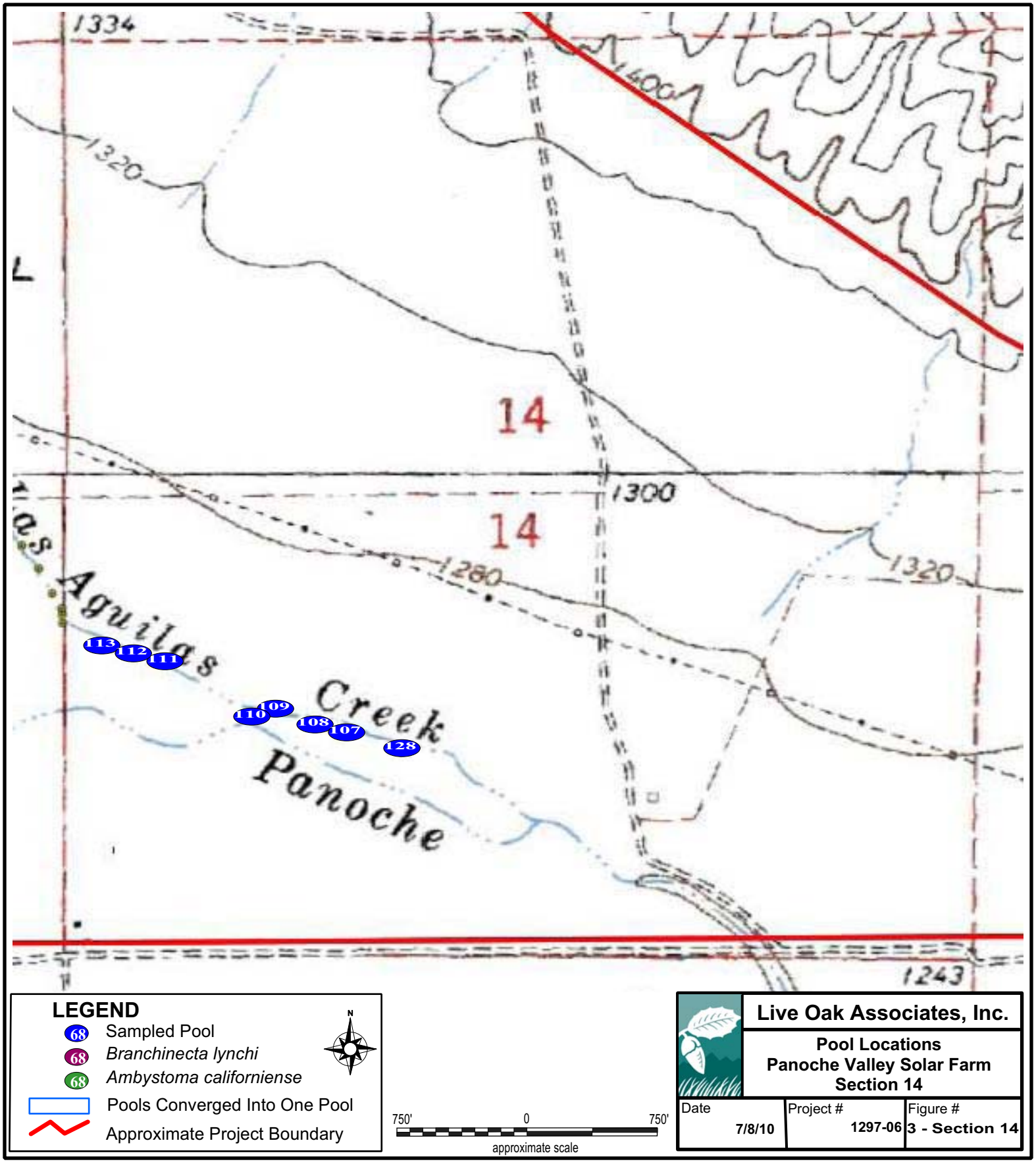
750' 0 750'

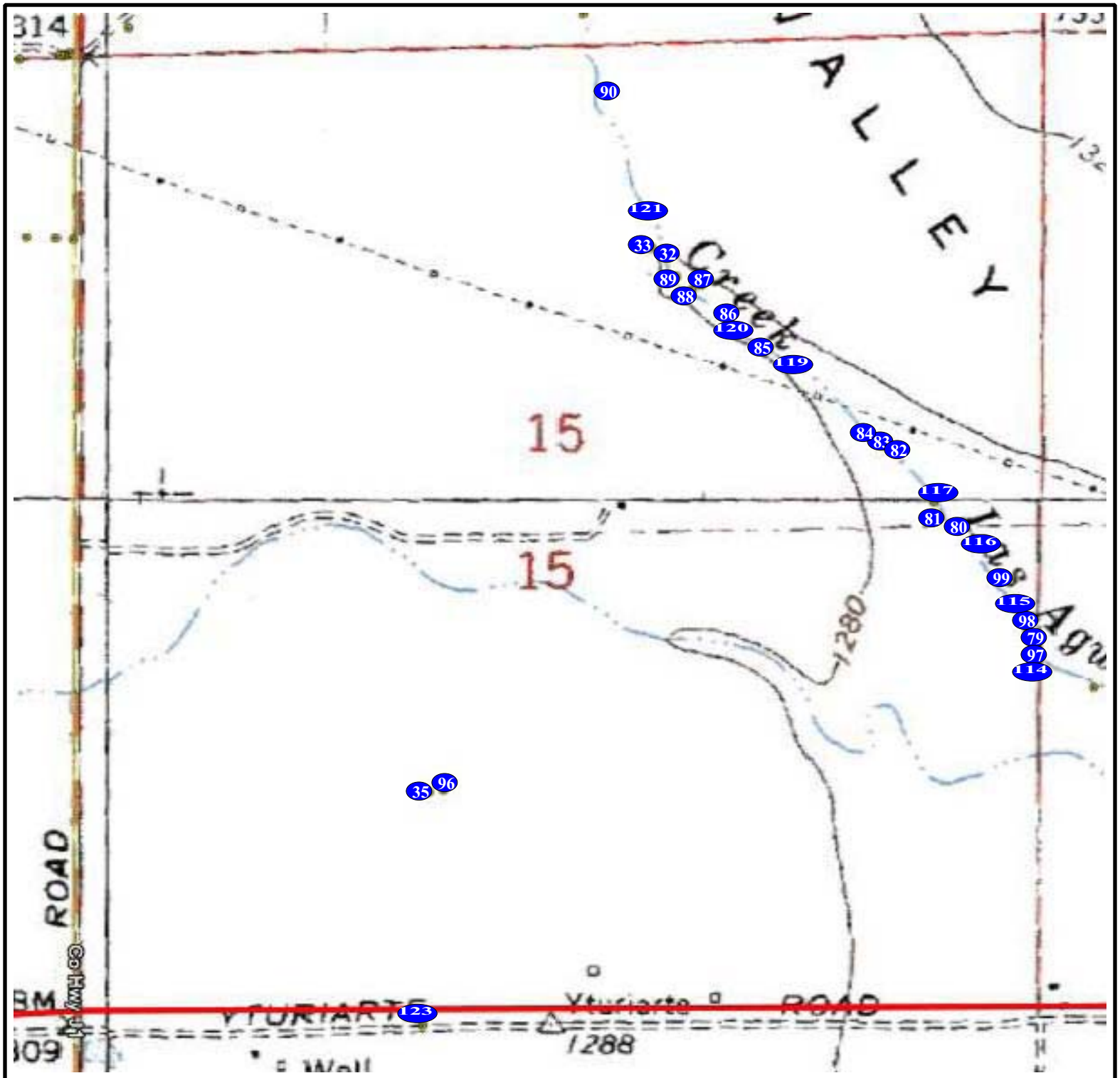
approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 11

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 11


1334
1400
1320
14
1300
14
1280
1320
Las Aguilas Creek
Panoche
113
112
111
110
109
108
107
128
1243
LEGEND
68 Sampled Pool
68 Branchinecta lynchi
68 Ambystoma californiense
Pools Converged Into One Pool
Approximate Project Boundary
N
750' 0 750'
approximate scale
Live Oak Associates, Inc.
Pool Locations
Panoche Valley Solar Farm
Section 14
Date 7/8/10
Project # 1297-06
Figure # 3 - Section 14



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

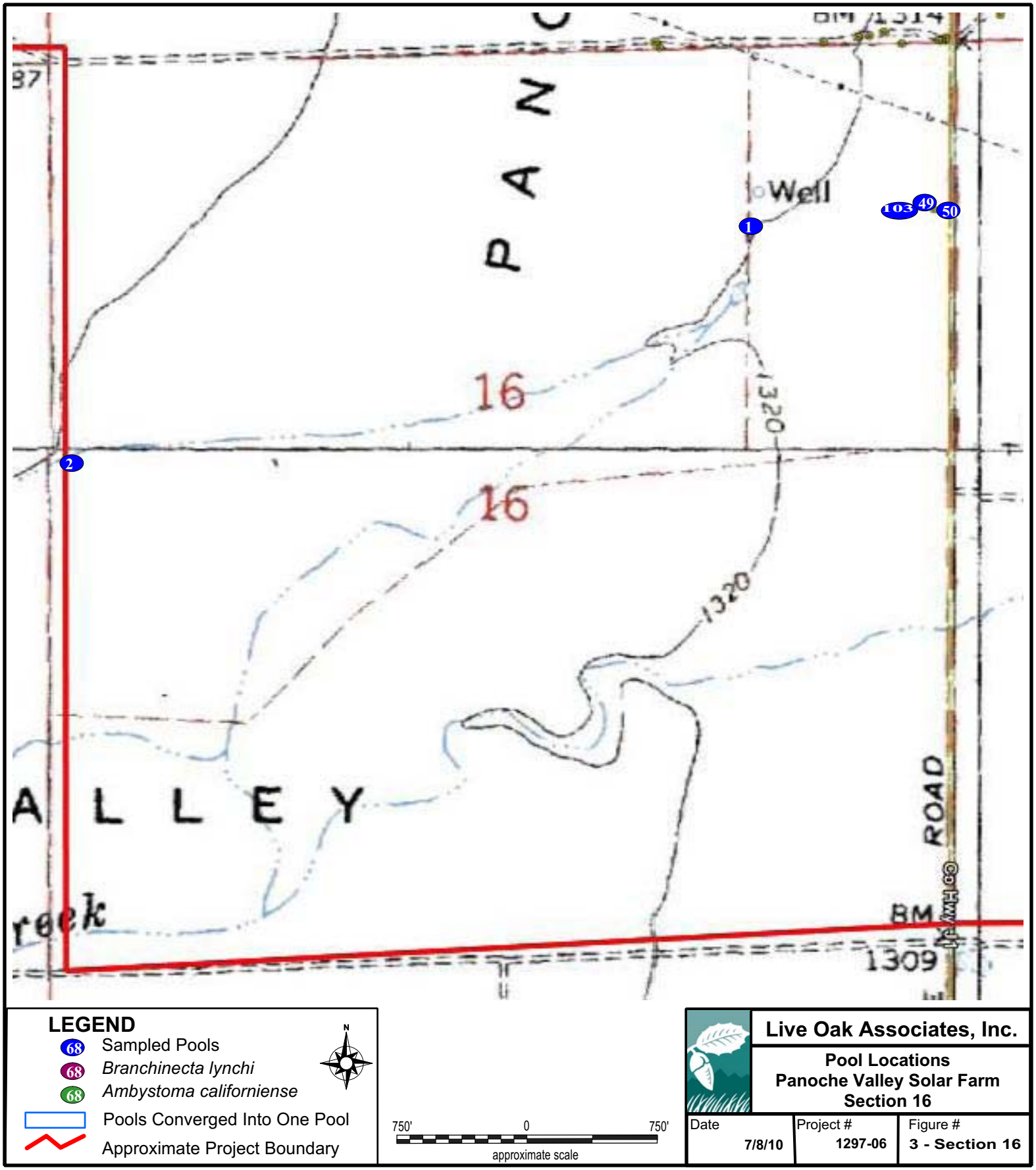
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 15

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 15



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

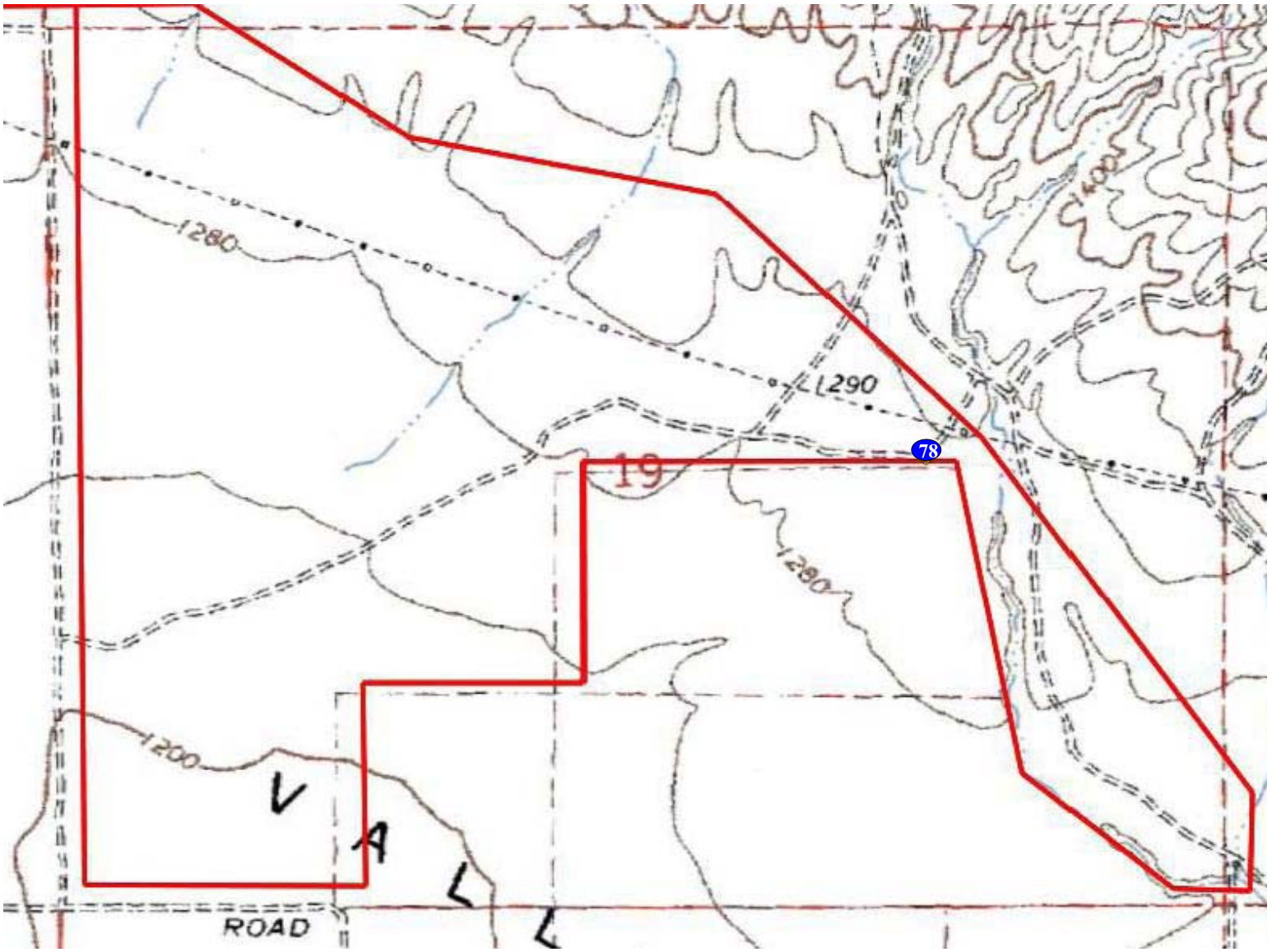
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 16

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 16



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 19

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 19

Voucher specimens collected during the wet season survey were submitted in accordance with the *Interim Survey Guidelines* (USFWS 1996) to the CAS by Geoff Cline of LOA on November 8, 2010. Live Oak Associates understands that Kansas Biological Survey will submit a representative sample of each cyst type recovered from the soil samples to either the CAS or LACM, as required by the USFWS guidelines for a protocol level survey.

3.3 Conclusion

Based on the results of the 2009/2010 protocol wet season surveys and 2010 dry season survey, it has been determined that the Federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*) is present in two adjacent pools, Pool 12 and Pool 13, on the PVSF project site. Pool 12 is a seasonal stock pond constructed from scraped earth bermed up across a shallow swale. Pool 13 is a depression immediately down gradient from Pool 12 presumably formed from the scraping of soil from this area to create the bermed dam of Pool 12. Other habitat sampled during the surveys contained no branchiopods and consisted primarily of ruderal pools associated with compacted depressions in dirt ranch roads or cattle troughs, as well as a few seasonal stock ponds and a number of natural pools forming in swales or drainages. Incidental findings of California tiger salamander occurred in Pool 16 (a seasonal stock pond) during the wet season surveys. Given the above average rainfall during the 2009/2010 rainy season it is doubtful any onsite branchiopod habitat was missed by the protocol survey effort.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Jeff Gurule

Signature:  . Date: January 14, 2011.

Permit # TE-168924-0

APPENDIX A:
DRY SEASON AUTHORIZATION LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
81440-2010-CPA-0180

September 14, 2010

Michele Korpos
Senior Project Manager
Live Oak Associates, Inc.
6840 Via Del Oro, Suite 220
San Jose, California 95119

Subject: Authorization to Commence Dry-Season Surveys for Vernal Pool Branchiopods at the Proposed Panoche Valley Solar Farm, San Benito County, California

Dear Ms. Korpos:

We have reviewed your request, dated July 29, 2010, and received by our office by electronic mail on July 30, 2010, to conduct dry-season surveys for federally listed vernal pool branchiopods, including the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*), for the proposed Panoche Valley Solar Project, San Benito County, California. You are requesting permission to conduct dry-season sampling at 128 pool locations identified during the wet-season surveys performed during the 2009/2010 wet season. The 90-day report for the protocol-level wet-season branchiopod surveys dated August 13, 2010, was received by our office by electronic mail on August 19, 2010. The results of the wet-season surveys identified one pool occupied by vernal pool fairy shrimp. The methods and findings included in the 90-day report for the wet-season surveys for the subject project are currently under review.

You request that the soil collection portion of the sampling be conducted by Davianna Ohlson, Melissa Denena, Jeff Gurule, and/or Austin Pearson under the terms and conditions of their recovery permits (TE1670750-0, TE108681-0, TE168924-0, TE108683-0 respectively) and performed in accordance with the methods described in the U.S. Fish and Wildlife Service's April 1996 *Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods* (Guidelines). In your request, you also request that Christopher Rogers (TE-796284-3) conduct the soil analysis and possible culture of any cysts collected.

The permits identified for Ms. Ohlson, Ms. Denena, and Mr. Pearson expired in December 2009. We do not authorize Davianna Ohlson, Melissa Denena, or Austin Pearson to conduct the proposed dry-season surveys. Christopher Roger's current recovery permit, TE-796284-5, does not authorize the culturing of cysts. We do not authorize Christopher Rogers to culture any cysts identified in the soil samples collected during the dry-season surveys.

We hereby authorize Jeff Gurule to conduct the dry-season surveys and Christopher Rogers to conduct the soil sieving and examination and cyst identification to genus. Per section V.h of the Guidelines, each fairy shrimp or tadpole shrimp cyst shall be identified to genus by a qualified biologist and the Service may require an independent review by a crustacean biologist of any vernal pool branchiopod or cyst identification. Further, section V.h states that, for each feature surveyed, if branchiopod cyst identification is made to genus, there are two options: 1) surveys may be suspended if it is agreed that one or more listed species are present or 2) a subsequent complete wet-season sampling survey shall be conducted. Surveys may continue at the remaining features on the project site; however, if all surveys are suspended, it must be assumed that all features are occupied by the listed entity.

We remind Mr. Gurule and Mr. Rogers of their responsibilities in reporting survey results to us, regardless of findings, and suggest that they review the permit for any special conditions that must be met. We request use of the dry-season data sheet available on our website (http://www.fws.gov/ventura/) during the dry-season surveys and that copies of the data sheets be included in future reports on the survey findings. If you have any questions, please contact Christopher Diel of my staff at (805) 644-1766, extension 305.

Sincerely,

Douglass M. Cooper
Deputy Assistant Field Supervisor

APPENDIX B:
DRY SEASON SOIL ANALYSIS REPORT

The University of Kansas

Kansas Biological Survey

8 December 2010

Eric Cherniss
Solargen Energy, Inc.
20400 Stevens Creek Blvd., Suite 740
Cupertino, CA 95014

SUBJECT: Results of Analyses of Soil Samples Collected from the Proposed Panoche Valley Project Site, San Benito County, California.

Dear Mr. Cherniss,

Live Oak Associates conducted a dry season survey of potential special status shrimp habitats at the proposed Panoche Valley project site, located in San Benito County, California. Soil samples were collected from 117 previously identified habitats judged to be suitable for special status shrimp species, and these samples were shipped to Kansas Biological Survey for processing and analyses. Special status shrimp eggs were collected from the soil samples analyzed from two features.

Kansas Biological Survey understands that Live Oak Associates will submit this report and all other pertinent materials and information to the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (DFG), as required by the USFWS guidelines for a protocol level survey.

Definitions

For the purpose of this report, special status shrimp are defined to include shrimp species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species). One special status tadpole shrimp (*Lepidurus packardi*) and two special status fairy shrimp species (*Branchinecta lynchi* and *Branchinecta longiantenna*) have the potential to occur at the proposed project site. In addition, two non-listed fairy shrimp species (*Branchincta lindahli* and *Linderiella occidentalis*) is known from the proposed project vicinity.

Species Accounts

Lepidurus packardi Simon, 1886
Lepidurus packardi, the Vernal Pool Tadpole Shrimp, is federally listed as an endangered species. This tadpole shrimp species is found in vernal pools throughout the Sacramento Valley, to the east side of San Francisco Bay (Rogers, 2001). Typically *Lepidurus packardi* is green in color, but may be mottled with brown in highly turbid water. *Lepidurus packardi* is omnivorous and generally forages on the bottoms of pools in dense vegetation. Tadpole shrimp tend to be

slow growing and are usually collected after the vernal pool has been ponded for 30 days (Rogers, 2001).

Branchinecta lynchi Eng, Belk & Eriksen, 1990
Branchinecta lynchi, the Vernal Pool Fairy Shrimp, is federally listed as a threatened species. This shrimp species is found in vernal pools throughout the Central Valley and western Riverside County in California, and near Medford, Oregon (Eriksen & Belk, 1999). This fairy shrimp species occurs in neutral to slightly alkaline vernal pools throughout the California Central Valley, and in rock outcrop pools along the Interior Coast Ranges, south of the Sacramento River Delta.

Branchinecta longiantenna Eng, Belk, & Eriksen, 1990
Branchinecta longiantenna, or the Longhorn Fairy Shrimp, is federally listed as an endangered species. This species is reported from small, shallow rock outcrop vernal pools, and grassy-bottomed vernal pools. This species of fairy shrimp has an extremely disjunct distribution, and is known only from three locations: a sandstone outcrop vernal pools along the Contra Costa/Alameda County line, a couple of grassy bottomed vernal pools at the Pixley National Wildlife Refuge in Merced County in the San Joaquin Valley, and from a couple of grassy bottomed vernal pools and roadside scrapes on the Carrizo Plain in San Luis Obispo County (Eriksen & Belk, 1999; Rogers, in prep).

Branchinecta lindahli Packard, 1883
This taxon is a common fairy shrimp with no legal status. This fairy shrimp is common in alkaline habitats throughout the western United States and northern Mexico. It typically occurs in pools that are turbid, alkaline or slightly saline, and often ringed with salt grass (*Distichilis* sp.). *Branchinecta lindahli* may be opportunistic, as it is common in a wide variety of artificial habitats, such as bulldozer scrapes, roadside ditches and railroad toe-drains (Eriksen & Belk, 1999; Rogers & Lang, in prep).

Linderiella occidentalis (Dodds, 1923)
The first species recorded from California, the California Linderiella is a common fairy shrimp from vernal pools throughout the California Central Valley and Coast Ranges of California. *Linderiella occidentalis* is typically white and green with red markings. *Linderiella occidentalis* tends to mature later than the *Branchinecta* species and is typical of vernal pools that are inundated for at least 20 days. *Linderiella occidentalis* was originally proposed for listing under the Endangered Species Act and was withdrawn from the proposal in 1995.

Methods

Live Oak Associates collected soil samples from 117 potential special status shrimp habitats at the proposed project site. Each soil sample was placed in a bag, labeled with the locality number, and shipped to the Kansas Biological Survey laboratory for analysis. All potential habitats were identified according to the numbers assigned to them in the field.

Laboratory Analysis

Soil samples were prepared for examination in the laboratory by dissolving the clumps of soil in water and sieving the material through 300- and 150- µm pore size screens. The small size of these screens ensures that the eggs from the shrimp species will be retained. The portion of each sample retained in the screens was dissolved in a brine solution to separate the organic material from the inorganic material. The organic fraction was then examined under a microscope.

Results

Potential special status shrimp eggs were recovered from the soil samples taken from features 12 and 13. The eggs present belong to the genus *Branchinecta* and are most likely *Branchinecta lynchi* as this species was previously identified from feature 12 and we are given to understand that feature 13 is adjacent to this habitat. These analyses are insufficient by themselves to determine that special status shrimp are absent from the other habitat on this site. The results of this survey must be combined with a protocol wet season survey, and concurrence must be sought from the USFWS before any additional determinations can be made.

If you have any questions please call me.

Sincerely,

D. Christopher Rogers
785.864.1714
Crustacean Taxonomist and Ecologist
Kansas Biological Survey
Central Plains Center for Bioassessment
Kansas University, Higuchi Hall
2101 Constant Avenue, Lawrence, KS 66047-3759 USA

References

Eriksen, C. H. & D. Belk. 1999. The fairy shrimps of California's pools, puddles, and playas. Mad River Press, Eureka, CA, USA. 196 pp.

Rogers, D.C. 2001. Revision of the Nearctic *Lepidurus* (Notostraca). Journal of Crustacean Biology 21: 991 – 1006.

United States Fish and Wildlife Service. September 19, 1994. Federal Register Final Rule; determination of endangered status for the conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp; and threatened status for the vernal pool fairy shrimp.

APPENDIX C:
POOL COORDINATES

Panoche Solar Farm Pool Locations **Grid: UTM** **Datum: NAD83** **Zone: 10S**

Pool #	Easting	Northing	Altitude
1	689496	4055757	1305 ft
2	688302	4055313	1342 ft
3	689829	4056101	1324 ft
4	689834	4056100	1319 ft
5	689763	4056093	1314 ft
6	689688	4056103	1316 ft
7	689326	4056083	1320 ft
8	688589	4056816	1372 ft
9	688595	4056815	1374 ft
10	689470	4057479	1342 ft
11	689036	4057670	1333 ft
12	688911	4057611	1335 ft
13	688921	4057611	1338 ft
14	687939	4057814	1379 ft
15	687945	4057818	1382 ft
16	688234	4058362	1380 ft
17	688572	4058300	1402 ft
18	689004	4058842	1332 ft
19	689014	4059176	1357 ft
20	688840	4058916	1356 ft
21	689086	4059160	1354 ft
22	689119	4058641	1330 ft
23	689120	4058634	1320 ft
24	689187	4058476	1331 ft
25	689181	4058467	1316 ft
26	689204	4058399	1318 ft
27	689270	4058041	1318 ft
28	689811	4057710	1306 ft
29	689938	4056148	1308 ft
30	690230	4056326	1294 ft
31	691090	4057257	1358 ft
32	690834	4055790	1271 ft
33	690806	4055805	1279 ft
34	690648	4056380	1286 ft
35	690460	4054895	1314 ft
36	689732	4056112	1308 ft
37	689708	4056105	1337 ft
38	689626	4056092	1327 ft
39	686835	4056546	1454 ft
40	689145	4057604	1309 ft
41	689113	4057614	1327 ft
42	689033	4057647	1329 ft
43	688292	4057609	1362 ft
44	689083	4058673	1320 ft

Pool #	Easting	Northing	Altitude
45	689115	4058610	1320 ft
46	689842	4056105	1301 ft
47	689839	4057712	1311 ft
48	690492	4058250	1374 ft
49	689828	4055797	1296 ft
50	689855	4055796	1294 ft
51	689333	4056074	1312 ft
52	686969	4056483	1469 ft
53	686814	4056424	1484 ft
54	686776	4056341	1486 ft
55	686907	4056277	1476 ft
56	688248	4057597	1378 ft
57	688437	4057625	1361 ft
58	688657	4057633	1351 ft
59	689019	4058710	1344 ft
60	689075	4059037	1331 ft
61	689072	4059015	1337 ft
62	689086	4058729	1325 ft
63	689107	4058687	1338 ft
64	689125	4058590	1320 ft
65	689181	4058543	1312 ft
66	689199	4058519	1310 ft
67	689190	4058645	1305 ft
68	689208	4058395	1332 ft
69	689269	4058326	1309 ft
70	689236	4058317	1301 ft
71	689323	4058278	1305 ft
72	689366	4058222	1305 ft
73	689288	4058054	1312 ft
74	689248	4057557	1329 ft
75	689355	4057533	1338 ft
76	689431	4057496	1320 ft
77	689443	4057485	1316 ft
78	696325	4053843	1330 ft
79	691459	4055163	1264 ft
80	691320	4055354	1257 ft
81	691291	4055371	1245 ft
82	691217	4055474	1270 ft
83	691196	4055487	1260 ft
84	691183	4055498	1279 ft
85	691004	4055643	1256 ft
86	690938	4055687	1267 ft
87	690890	4055745	1274 ft
88	690875	4055737	1275 ft

Pool #	Easting	Northing	Altitude
89	690848	4055758	1285 ft
90	690724	4056063	1285 ft
91	690585	4056501	1294 ft
92	689917	4057463	1316 ft
93	691576	4056566	1361 ft
94	691108	4057252	1362 ft
95	689847	4056821	1301 ft
96	690484	4054899	1289 ft
97	691460	4055152	1241 ft
98	691441	4055189	1236 ft
99	691385	4055274	1236 ft
100	686848	4056217	1490 ft
101	689315	4057548	1331 ft
102	689029	4058943	1312 ft
103	689781	4055798	1307 ft
104	687276	4056536	1469 ft
105	689824	4057202	1308 ft
106	689163	4057595	1323 ft
107	691959	4054950	1247 ft
108	691936	4054959	1252 ft
109	691827	4054980	1234 ft
110	691813	4054979	1246 ft
111	691629	4055068	1256 ft
112	691593	4055078	1253 ft
113	691552	4055092	1249 ft
114	691461	4055137	1258 ft
115	691417	4055233	1251 ft
116	691346	4055332	1252 ft
117	691281	4055396	1256 ft
118	691206	4055485	1269 ft
119	691049	4055621	1263 ft
120	690950	4055672	1264 ft
121	690796	4055862	1268 ft
122	690685	4056192	1292 ft
123	690458	4054510	1277 ft
124	689225	4058981	1329 ft
125	689226	4059076	1346 ft
126	689230	4059090	1336 ft
127	689092	4058711	1338 ft
128	692072	4054918	1258 ft

APPENDIX D:
PHOTOS

Photo 1: Looking SW at Pool #12 - a stock pond. Vernal pool fairy shrimp (*Branchinecta lynchi*) were observed in this pool on 3/16/10. The pool to the left, Pool #13, as well as Pool #12 were found to contain *Branchinecta* cysts during dry season surveys. It is assumed the *Branchinecta* cysts are *Branchinecta lynchi*.

Photo 2: Looking SE at Pool #5, a natural vernal pool at the toe of a swale. No shrimp were found in this pool during the 2009/2010 wet season survey or 2010 dry season survey.

Photo 3: LOA Biologist Mr. Jeff Gurule (TE-168924) sampling Pool #50 at the intersection of a ranch road and Little Panoche Road looking east. This pool is an example of the many ruderal pools associated with the ranch roads on the site. No shrimp were found in this pool during the 2009/2010 wet season survey and 2010 dry season survey.

Photo 4: Incidental California tiger salamander observation from Pool #16 on May 11th, 2010.

Photo 5: Looking south across the study area.

Photo 6: Looking north across the study area.

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

PROTOCOL-LEVEL WET SEASON BRANCHIOPOD SURVEY RESULTS 90-DAY REPORT PANOCHE VALLEY SOLAR FARM SAN BENITO COUNTY, CALIFORNIA (Tracking Number 81440-2010-CPA-0023)

Prepared by:

LIVE OAK ASSOCIATES, INC.

Austin Pearson, B.S., Director of Ecological Services
Jeff Gurule, B.A., Staff Ecologist
Geoffrey Cline, M.S., Staff Ecologist

Prepared for:

SOLARGEN ENERGY
Solargen Energy, Inc.
Eric Cherniss
VP Project Development
20400 Stevens Creek Boulevard, Suite 700
Cupertino, CA 95014

August 13, 2010 PN 1297-06

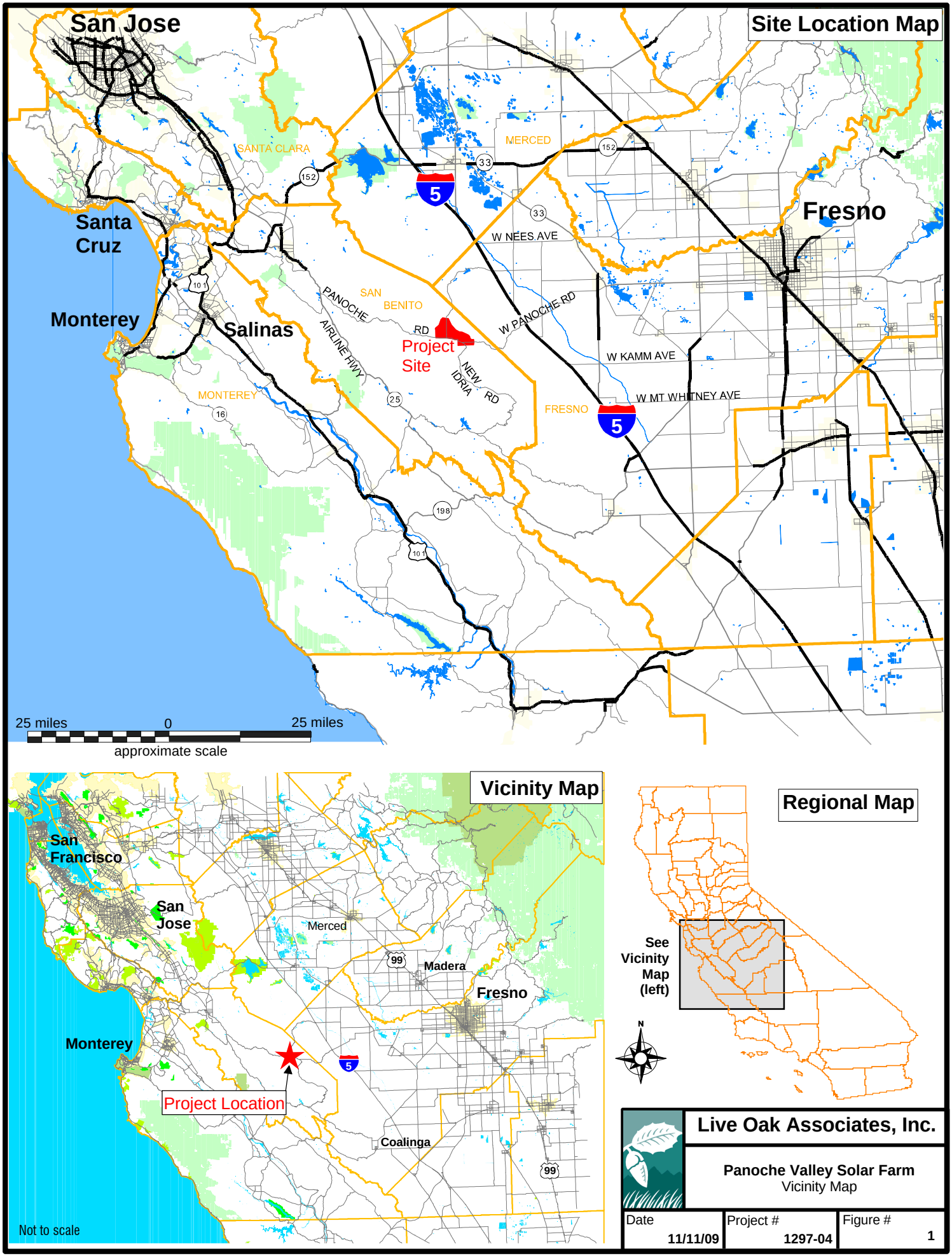
TABLE OF CONTENTS

1.0 INTRODUCTION AND SITE DESCRIPTION

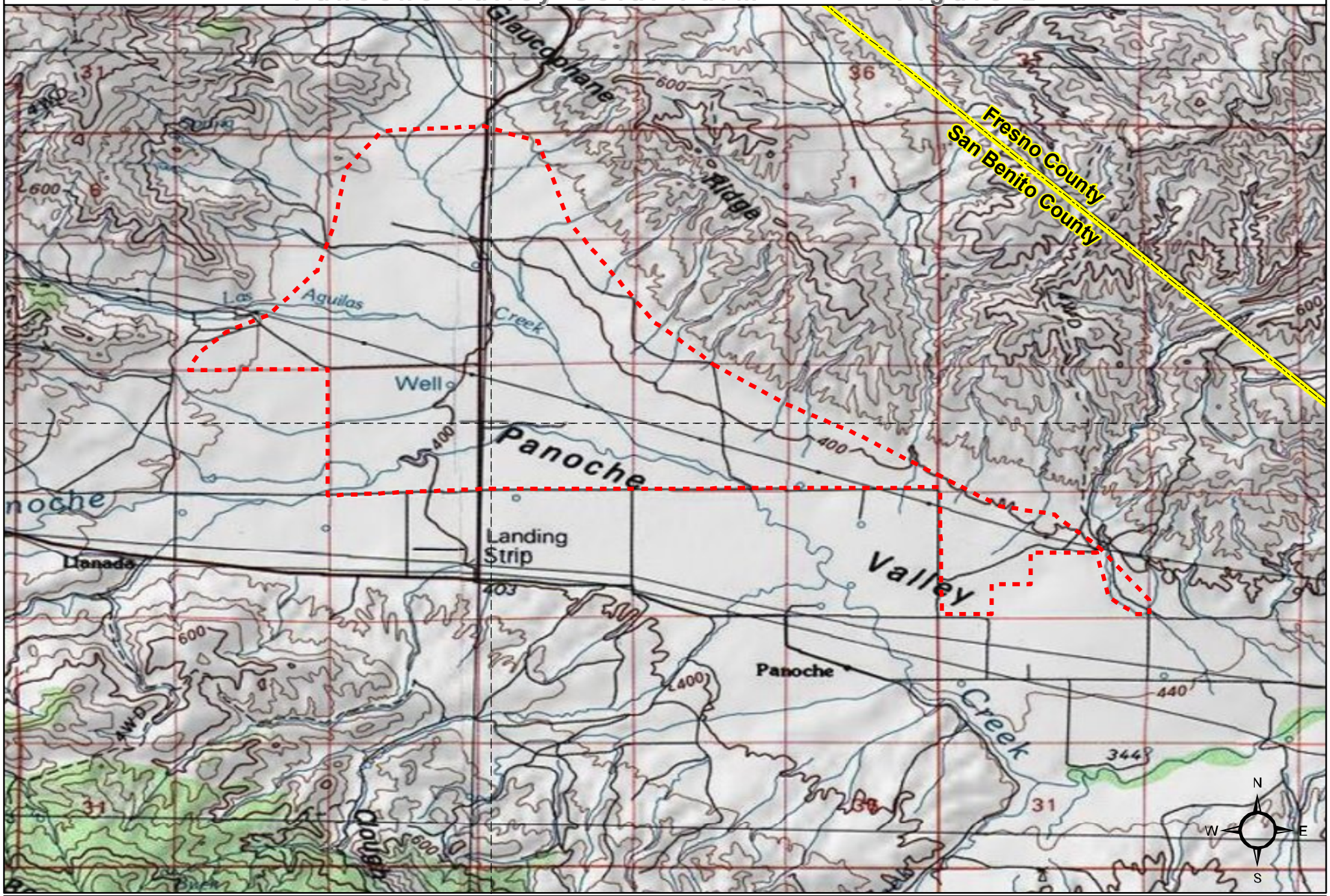
Protocol-level wet-season branchiopod surveys were conducted by Live Oak Associates, Inc. (LOA) on the Panoche Valley Solar Farm (PVSF) project site in San Benito County, California. Surveys consisted of protocol level wet season sampling in 2009/2010. The site or study area consists of approximately 4,885-acres, located in Panoche Valley approximately 15 miles west of Interstate 5 and six miles south of Mercey Hot Springs near the intersection of Panoche Road and Little Panoche Road (Figure 1). The site can be found on the Cerro Colorado, Mercey Hot Springs, Llanada, and Panoche, California U.S.G.S quadrangles, in Sections 3-4, 8-11, and 13-16, Township 15 South, Range 10 East and Section 19, Township 15 South, Range 11 East (Figure 2).

All the parcels within the study area are used for cattle grazing. The site is surrounded by rangeland and bordered to the west by the Gabilan Range and to the east by the Panoche Hills. A number of drainages and creeks are present in the area including the Panoche and Las Aguilas Creeks. The portion of the Valley associated with the proposed project ranges in elevation from approximately 1200 feet National Geodetic Vertical Datum (NGVD) to approximately 1490 feet NGVD.

Thirteen soil types from nine soil series were identified on the project site. The Riverwash soil type is the only soil considered hydric. This soil type is considered hydric due to frequent flooding for long durations or very long durations during the growing season. Riverwash consists of mixed water-washed sand and gravel, occurs along streams or rivers and is often flooded during storm events. Within the study area, Riverwash soils are associated with Panoche Creek and portions of Las Aguilas Creek. The Panoche Creek channel was not considered potential habitat for fairy shrimp or tadpole shrimp due to high flows that periodically scour the creek channel. Ponded areas that were sampled consisted primarily of two types; 1) Hard-packed depressions associated with ranch roads and cattle troughs which were extremely ruderal in nature and were repeatedly disturbed by vehicle traffic and/or cattle, and 2) Natural and artificial depressions within natural swales. Annual precipitation in the general vicinity of the site is highly variable from year to year. Annual rainfall ranges between 9 and 13


Site Location Map
San Jose
Santa Cruz
Monterey
Salinas
Fresno
SANTA CLARA
MERCED
MONTEREY
FRESNO
SAN BENITO
PANOCHE RD
W PANOCHE RD
W NEES AVE
W KAMM AVE
W MT WHITNEY AVE
AIRLINE HWY
NEW IDRIA RD
Project Site
5
152
33
101
25
16
198
25 miles
0
25 miles
approximate scale
Vicinity Map
San Francisco
San Jose
Merced
Madera
Fresno
Monterey
Coalinga
99
Project Location
Not to scale
Regional Map
See Vicinity Map (left)
N
Live Oak Associates, Inc.
Panoche Valley Solar Farm
Vicinity Map
Date
11/11/09
Project #
1297-04
Figure #
1

Panoche Valley Solar Farm Figure 2



County Boundary Study Area Boundary USGS Quads: Cerro Colorado, Mercey Hot Springs, Panoche, Llanada

POWER ENGINEERS

R:\117257_Ponoche\DD\GIS\Applications\QuadMap_Print Date: 11/11/2009

1:63,360 1 inch=1 mile 0 1 2 Miles

Solargen Energy

inches, almost 85% of which falls between October and March. During drought years, precipitation totals may only reach 5 inches per year. Storm-water infiltrates the soils of the site, but when field capacity has been reached, gravitational water flows into the creeks and drainages.

2.0 METHODS

In order to determine the presence or absence of shrimp species on the PVSF project site, LOA conducted protocol-level wet-season branchiopod surveys in the winter and spring of 2009/2010. All surveys were conducted in accordance with the *Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Brachiopods* (USFWS 1996).

LOA was authorized to initiate branchiopod surveys by David Pereksta with the U.S. Fish and Wildlife Service (USFWS) on November 24, 2009 (Appendix A). Wet season surveys were conducted throughout winter and spring of 2009/2010.

Jeff Gurule (TE-168924) conducted most of the wet-season pool sampling. Data was recorded in the field by Jeff Gurule and Austin Pearson (TE-108683-0) with the assistance of Geoffrey Cline (an un-permitted LOA biologist) when necessary. Data was recorded on a previously approved data sheet, authorized via email by David Kelly with the USFWS on November 12, 2008 (See Appendix A). The data sheet is an Excel spreadsheet, with data entered in the field directly into the spreadsheet via a PDA. The 2009/2010 wet season data is presented in Appendix B.

2.1 Wet Season Sampling

The *Interim Survey Guidelines* (USFWS 1996) require that protocol-level wet season surveys begin once ponds are inundated with greater than three centimeters after 24 hours of a storm event. Following the initial inundation, ponds must be sampled at least every two weeks for as long as they are inundated or until they have experienced 120 days of continuous inundation, whichever is shorter. However, if ponds dry, then refill, the 120 day period starts anew.

After each substantial rain event the site was monitored to determine if the pools and puddles were inundated. Pools on the site began filling in December 2009 with pools receiving runoff from hard-packed surfaces generally filling first. As such, the sampling of onsite pools and puddles began on December 21, 2009 and continued on January 4, 5, 18, and 19, February 1, 2, 16, and 17, March 2, 3, 16, 17, and 30, April 13, 14, 27, and 28, May 11 and 25, and June 7, 2010.

After significant rain events increased in January and the soils became more saturated, a few pools previously sampled separately combined to form larger pools that were then sampled as one pool. Sampling continued in these now larger combined pools, with data only collected from the aggregate pools. In order to continue to identify the donor pools, the aggregate pools were numbered using the pool numbers of the donor pools (ex. Aggregate Pool Number 24, 25 consisted of donor pools 24 and 25). Each area once occupied by an individual donor pool, now within the boundaries of the aggregate pool, was dip-netted to assure a thorough sampling of the aggregate pools.

2.2 USFWS Reporting and Voucher Specimen

The USFWS requires that a 90-day report be submitted to the appropriate field office (Sacramento USFWS in this case) following the completion of protocol-level branchiopod surveys. Additionally, the USFWS requires that a "Notice of Presence" be submitted upon identifying a federally listed branchiopod species from the project site authorized for sampling within ten working days of the finding. It is also required that a California Natural Diversity Data Base (CNDDB) field survey form be submitted to CDFG for listed species observed on site.

Any federally listed branchiopods collected during the protocol-level surveys must be submitted as voucher specimens to the California Academy of Sciences (CAS) or the Natural Museum of Los Angeles County (LACM). All specimens have to be preserved and submitted according to the CAS or LACM strict standards.

3.0 RESULTS

A total of 128 pools met the criteria for inundation in 2009/2010 and were sampled for branchiopod species (Figure 3). As previously mentioned some of these 128 pools combined after initial sampling events to form larger pools, temporarily reducing the number of actual pools in the sample set. Once the pools were disconnected from each other they were no longer considered a group. The 2009/2010 rainy season totals for the Panoche Weather Station is 14.57 inches, 137% of the yearly average for Panoche, California (California Department of Water Resources, Station PNH, accessed online June 17th, 2010). Even though total precipitation was above average, only one pool experienced an Anostracan hatch.

3.1 Wet Season Sampling

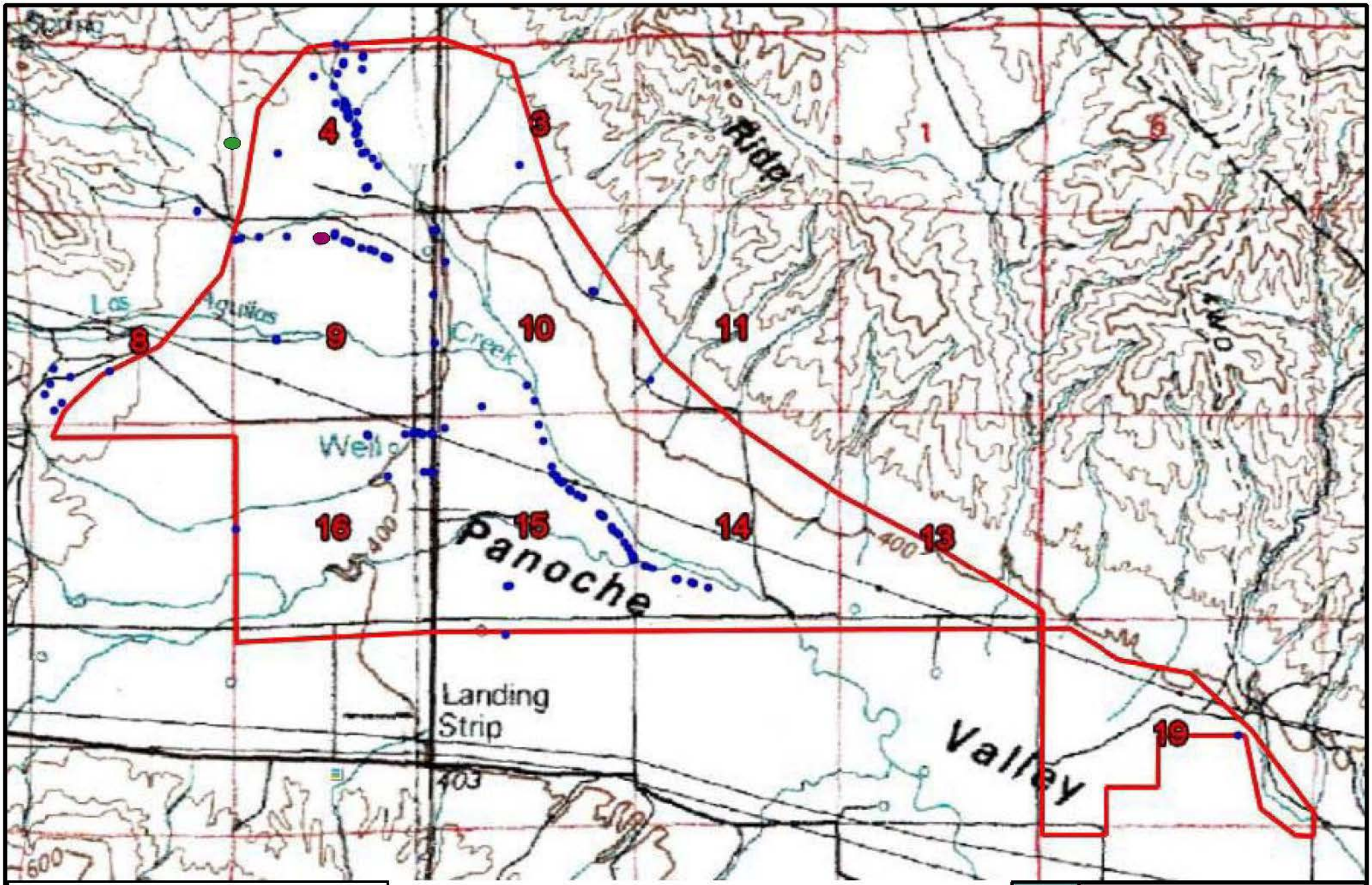
Only one anostracan species, The Federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*), was detected during 2009/2010 wet season sampling on the PVSF project site. *Branchinecta lynchi* were detected in a single pool (Pool #12) on March 16, 2010. Results of the 2009/2010 wet season Branchiopod surveys are presented in Figures 3 below. Pool #16 was found to contain California tiger salamander larvae (*Ambystoma californiense*), which were observed incidentally. Tadpole shrimp (*lepiduris packerdi*) were not detected on the site. Datasheets are presented in Appendix B. Pool coordinates are presented in Appendix C and photographs of the site, with photo specific information, are located in Appendix D.

3.2 USFWS Reporting and Voucher Specimen

This report serves as the 2009/2010 wet season branchiopod 90-day report for the PVSF project site. Notification of the presence of the Federally Threatened *Branchinecta lynchi* was sent to Christopher Diel at the Ventura, CA Branch of the USFWS via an email on March 24, 2010.

As required by the USFWS, a CNDDB form will be submitted to CDFG in order to document the presence of *Branchinecta lynchi* found during the 2009/2010 wet season surveys.

Voucher specimens will be submitted in accordance with the *Interim Survey Guidelines* (USFWS 1996).



LEGEND

- Sampled Pools
- *Branchinecta lynchi*
- *Ambystoma californiense*
- Approximate Project Boundary

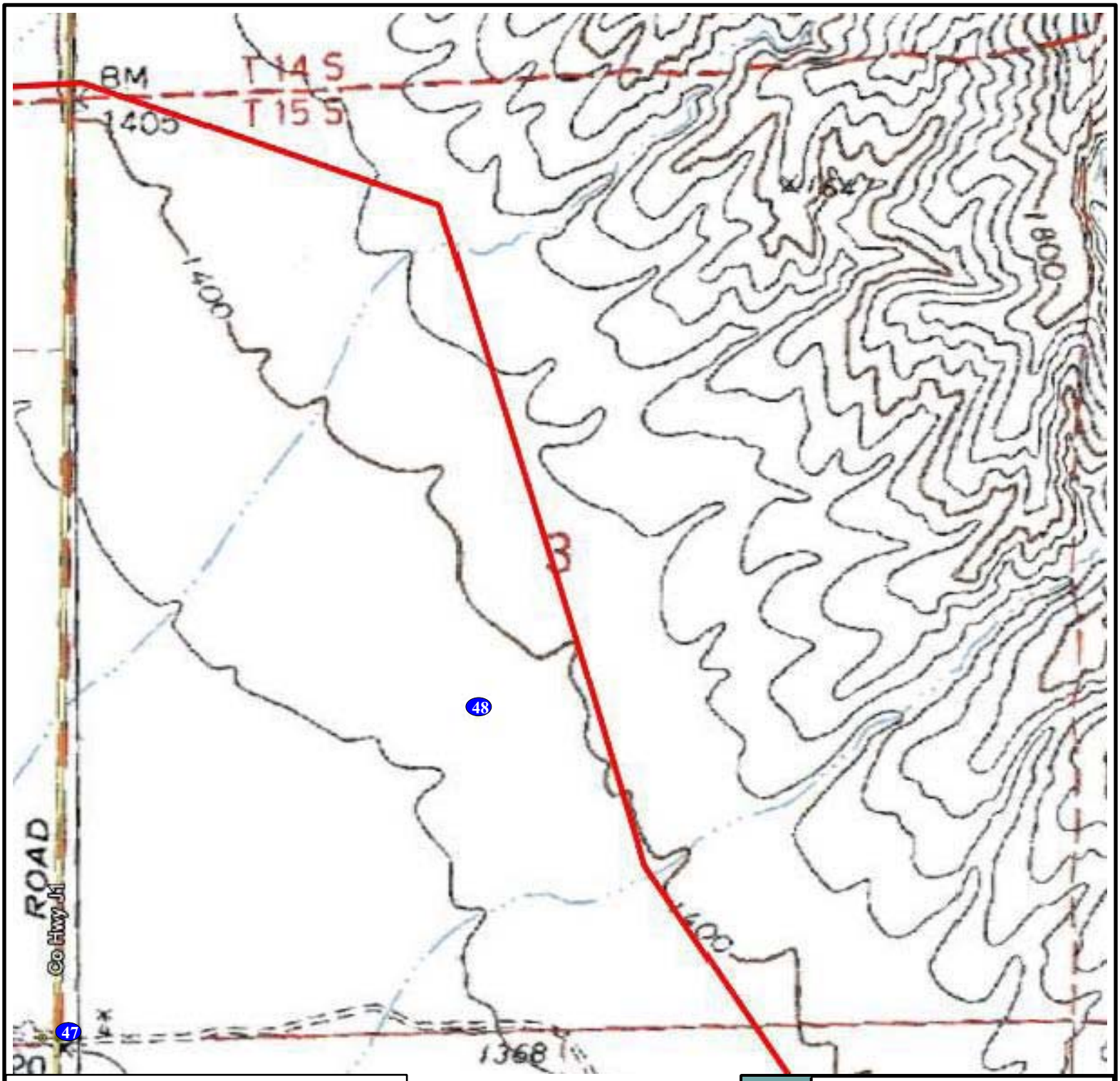
1 Mile 0 1 Mile

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Overview Map

Date	Project #	Figure #
7/8/10	1297-06	3 - Overview



LEGEND

- 68 Sampled Pool
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

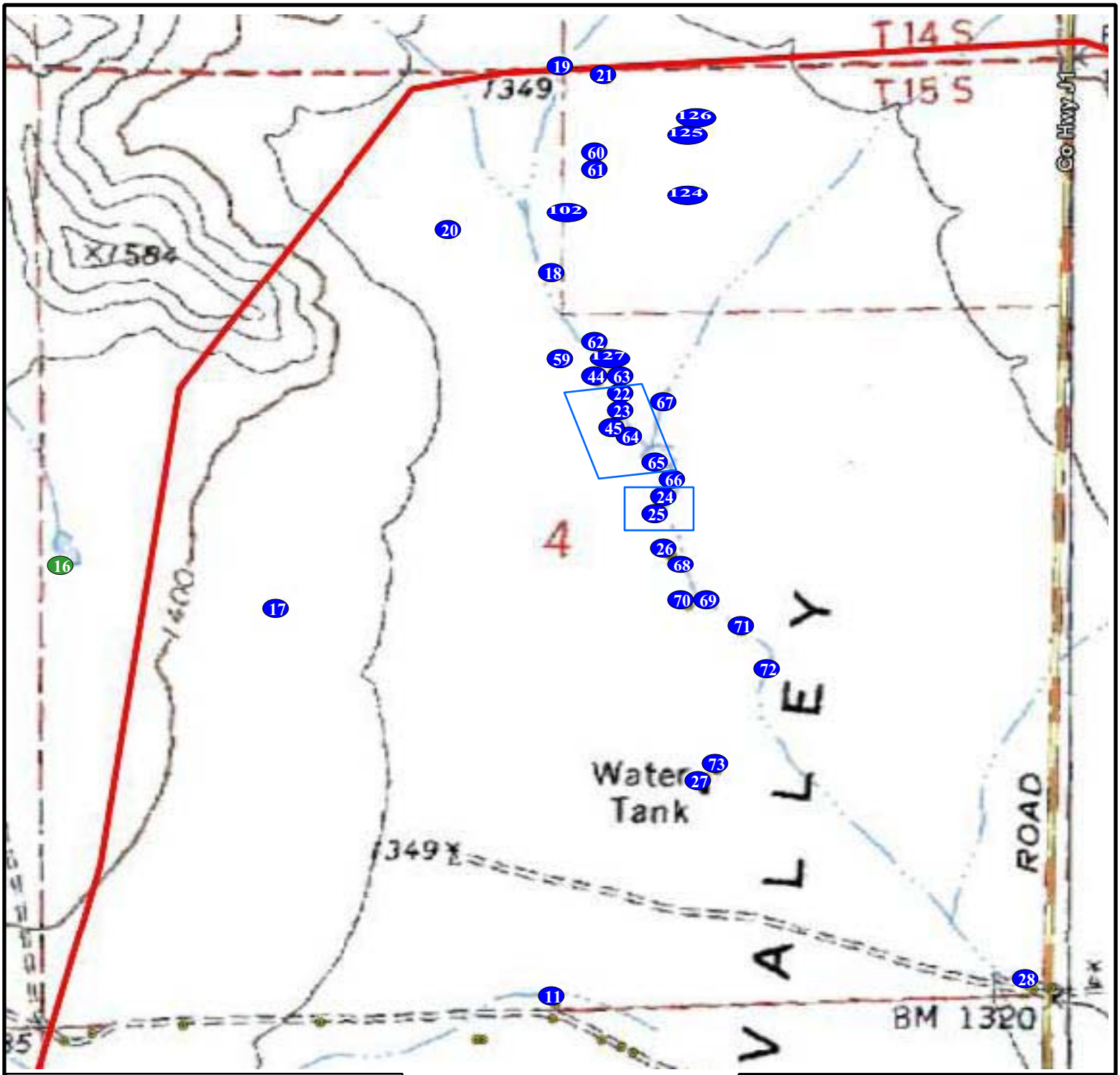
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 3

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 3



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

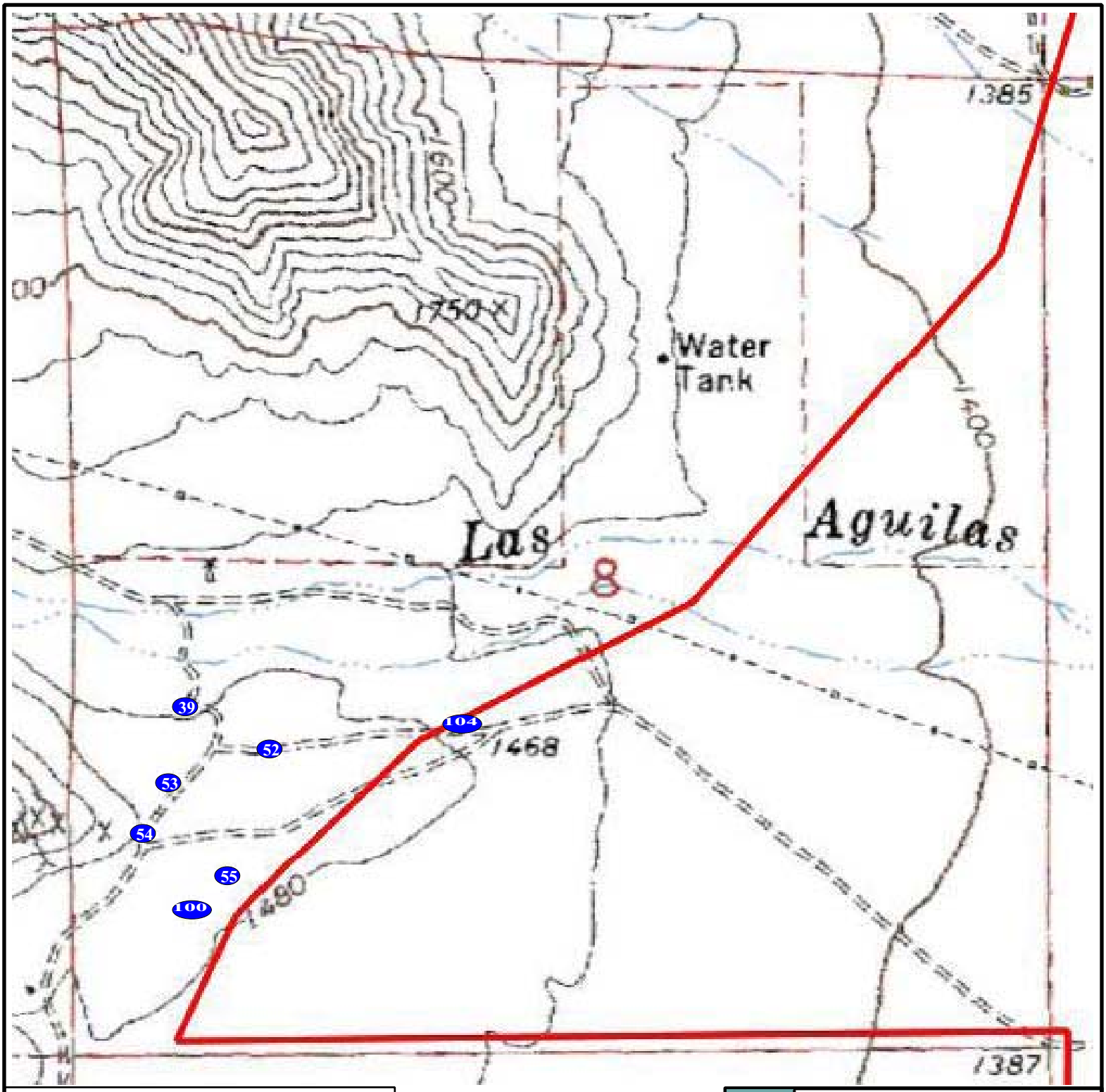
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 4

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 4



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

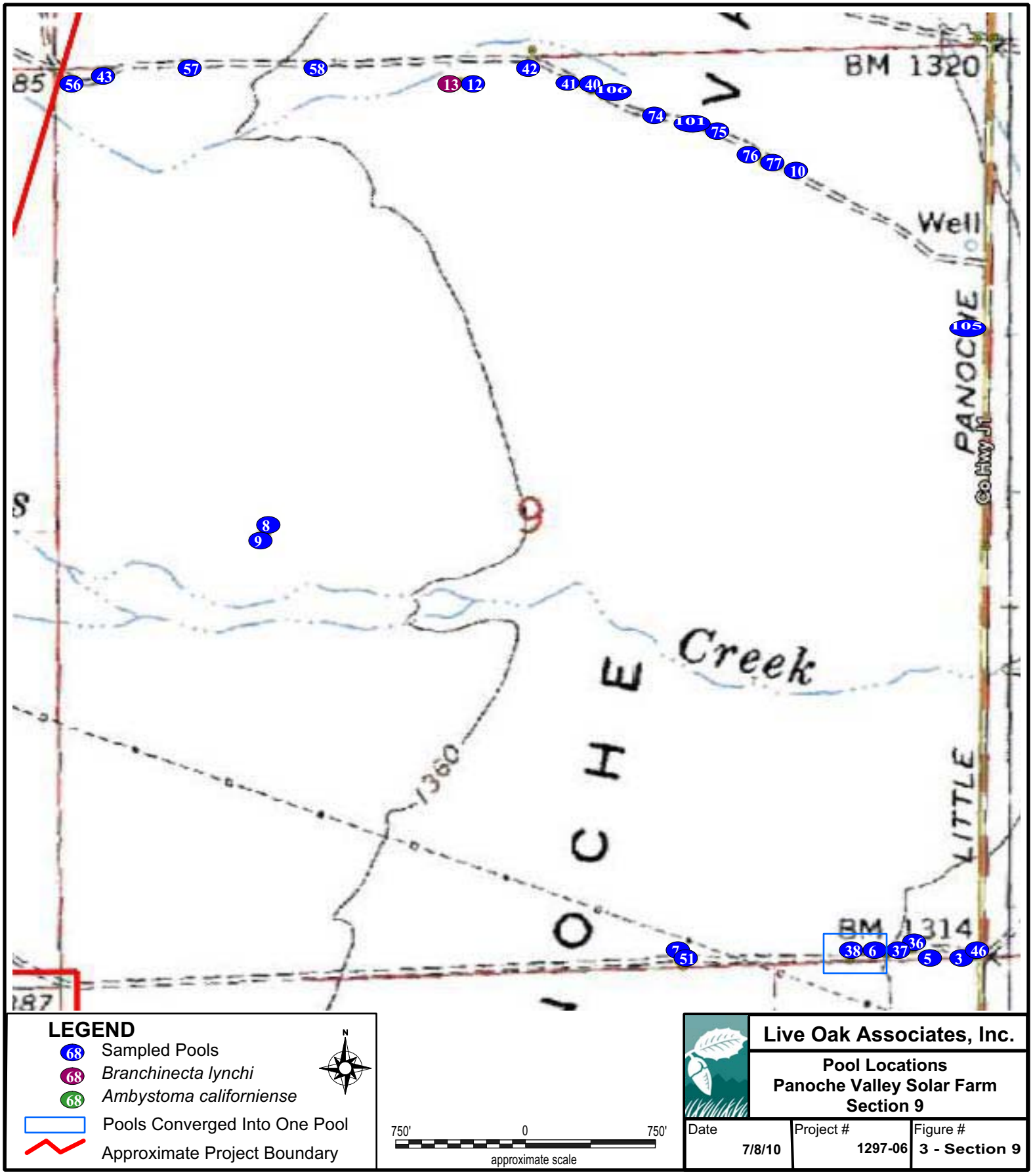
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 8

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 8



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

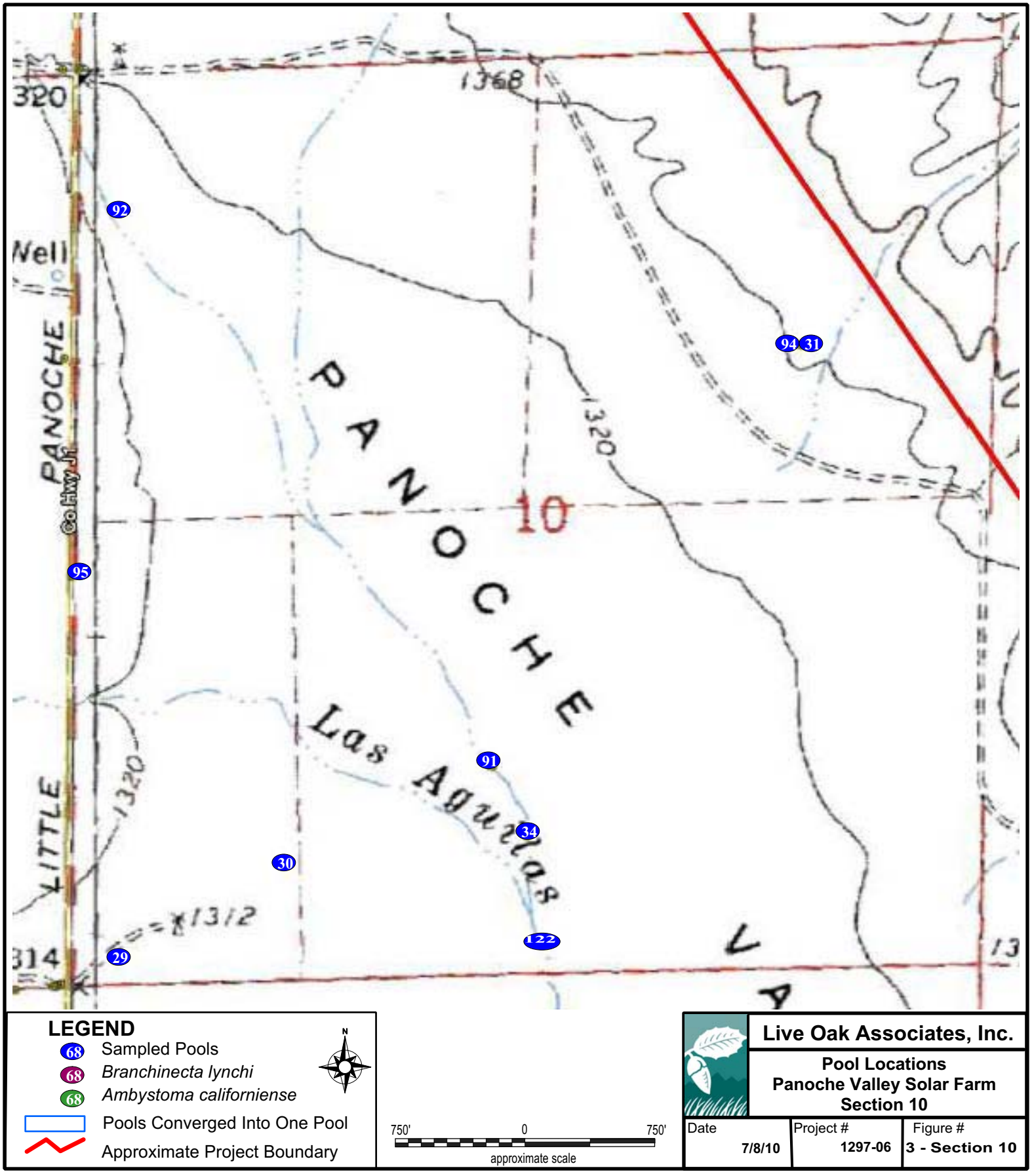
N

750' 0 750'
approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 9

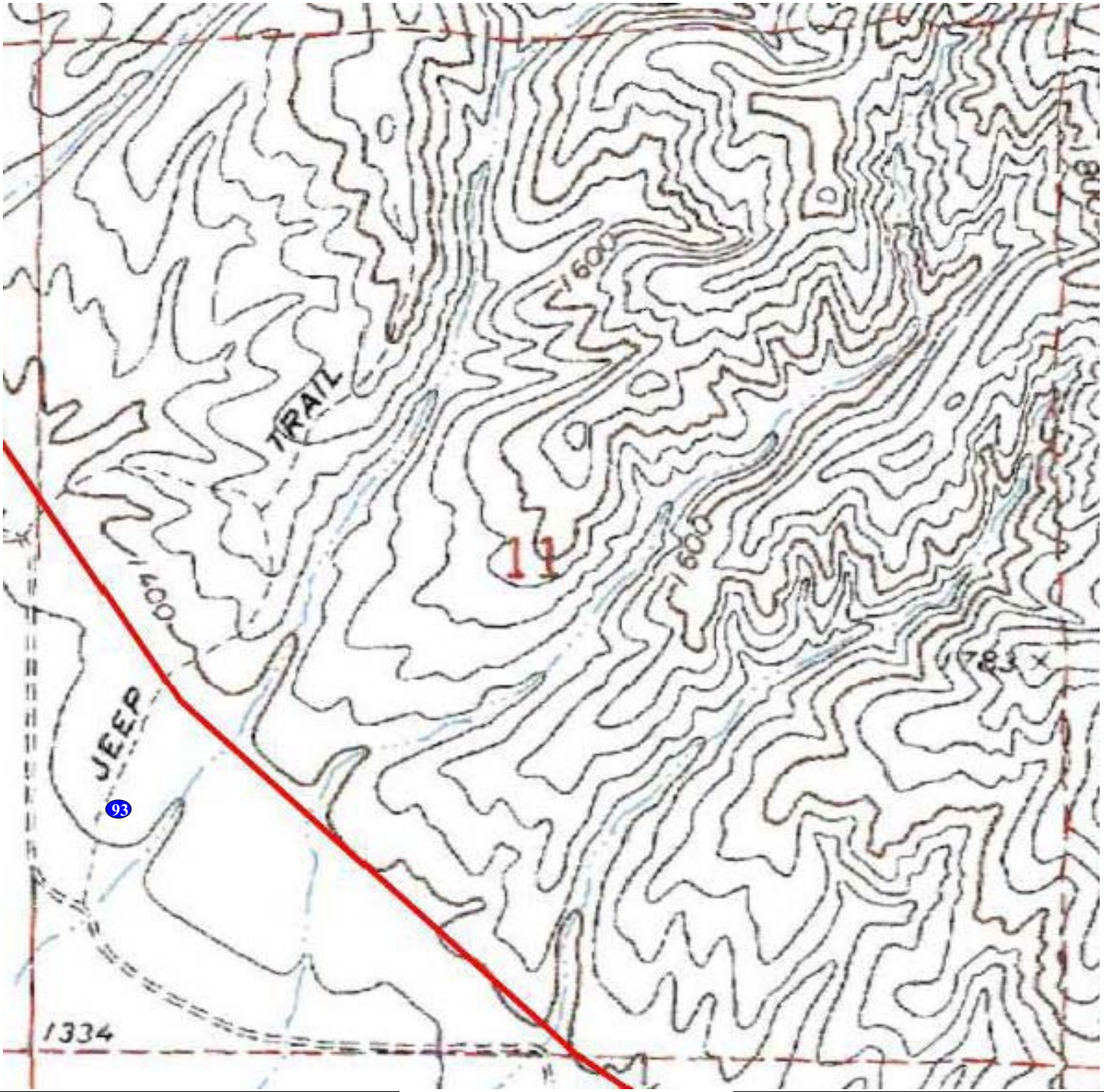
Date	Project #	Figure #
7/8/10	1297-06	3 - Section 9



Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 10

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 10



LEGEND

- 68 Sampled Pool
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

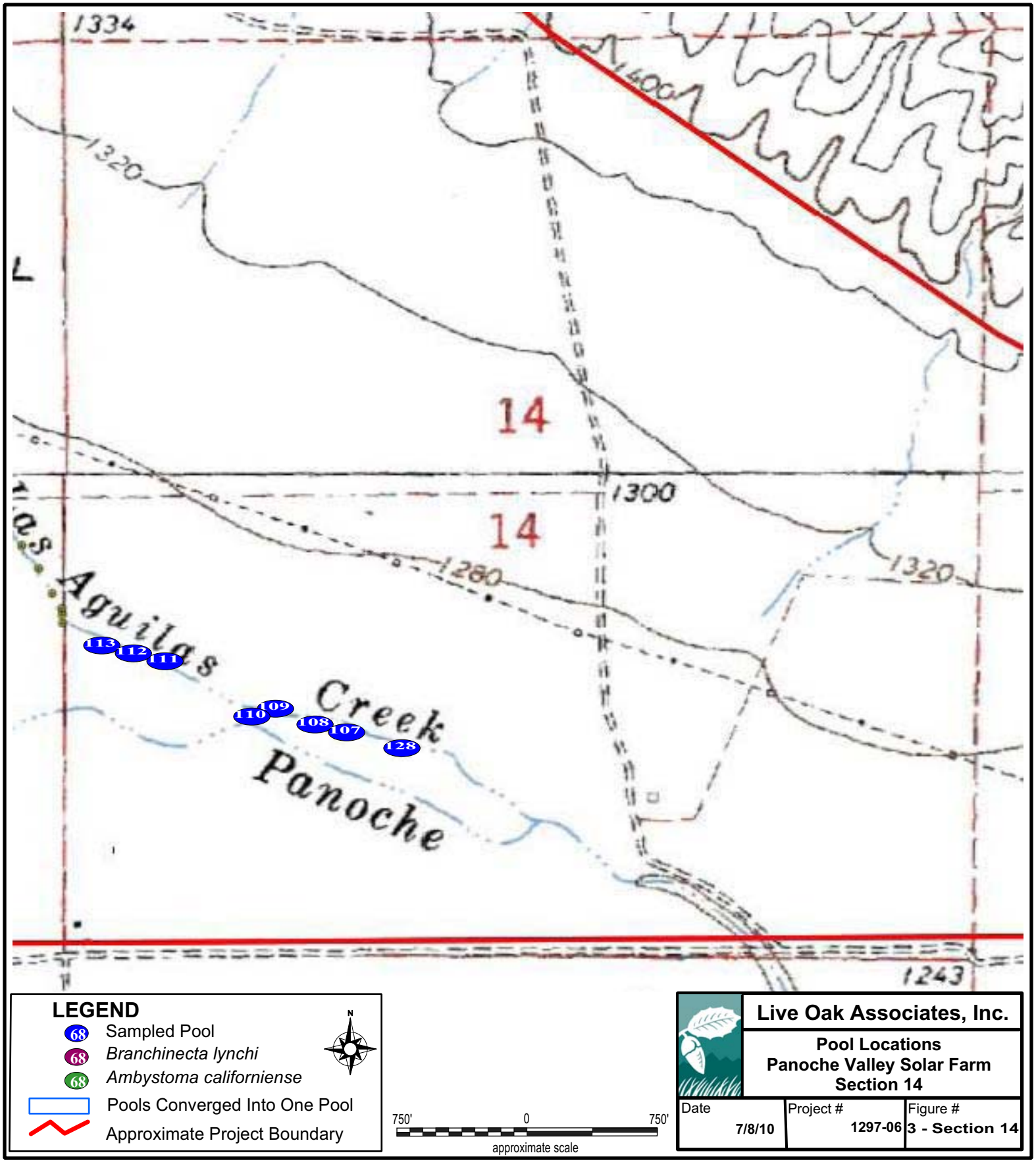
750' 0 750'

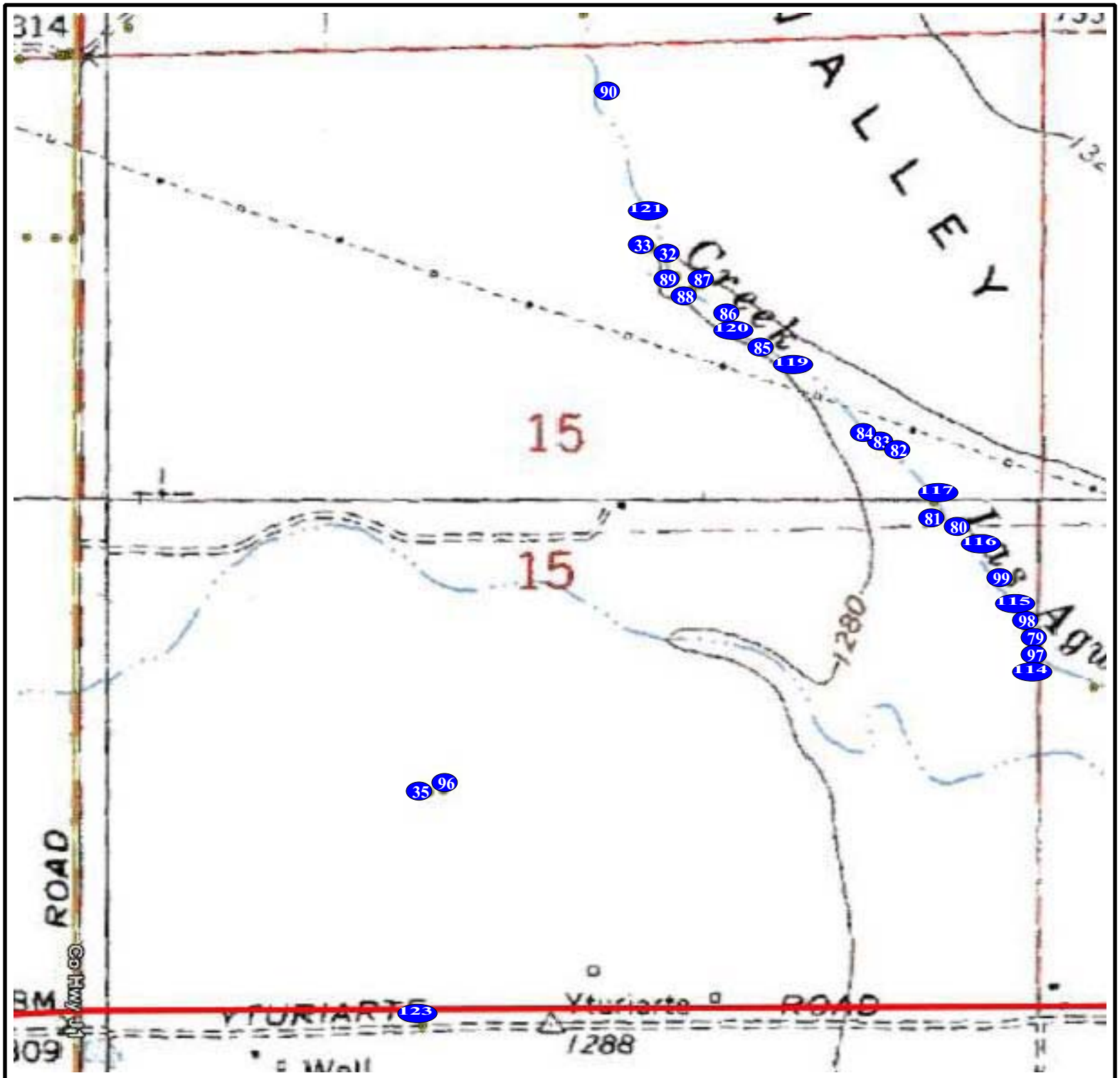
approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 11

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 11


1334
1400
1320
14
1300
14
1280
1320
Las Aguilas Creek
Panoche
113
112
111
110
109
108
107
128
1243
LEGEND
68 Sampled Pool
68 Branchinecta lynchi
68 Ambystoma californiense
Pools Converged Into One Pool
Approximate Project Boundary
N
750' 0 750'
approximate scale
Live Oak Associates, Inc.
Pool Locations
Panoche Valley Solar Farm
Section 14
Date 7/8/10
Project # 1297-06
Figure # 3 - Section 14



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

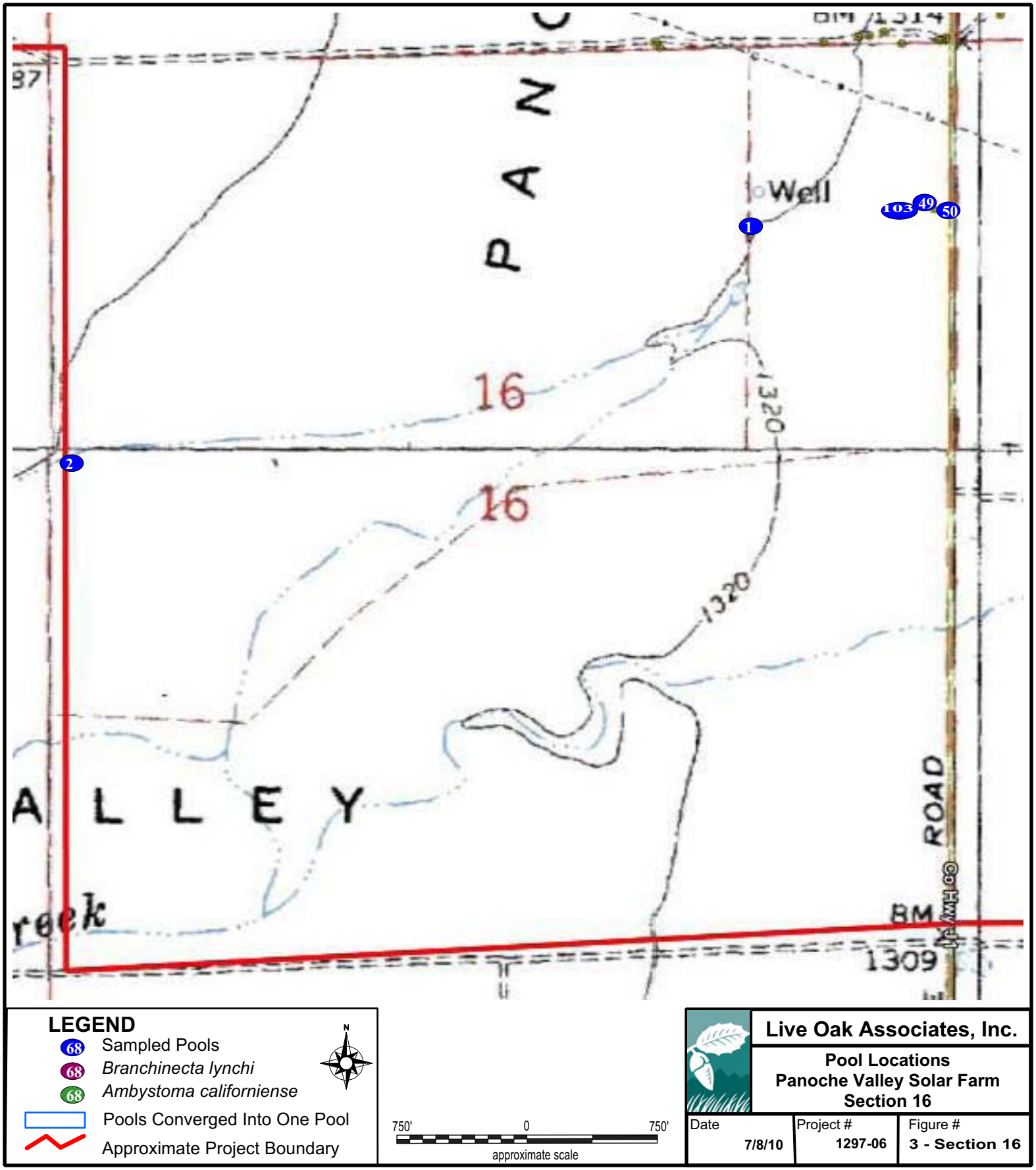
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 15

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 15



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

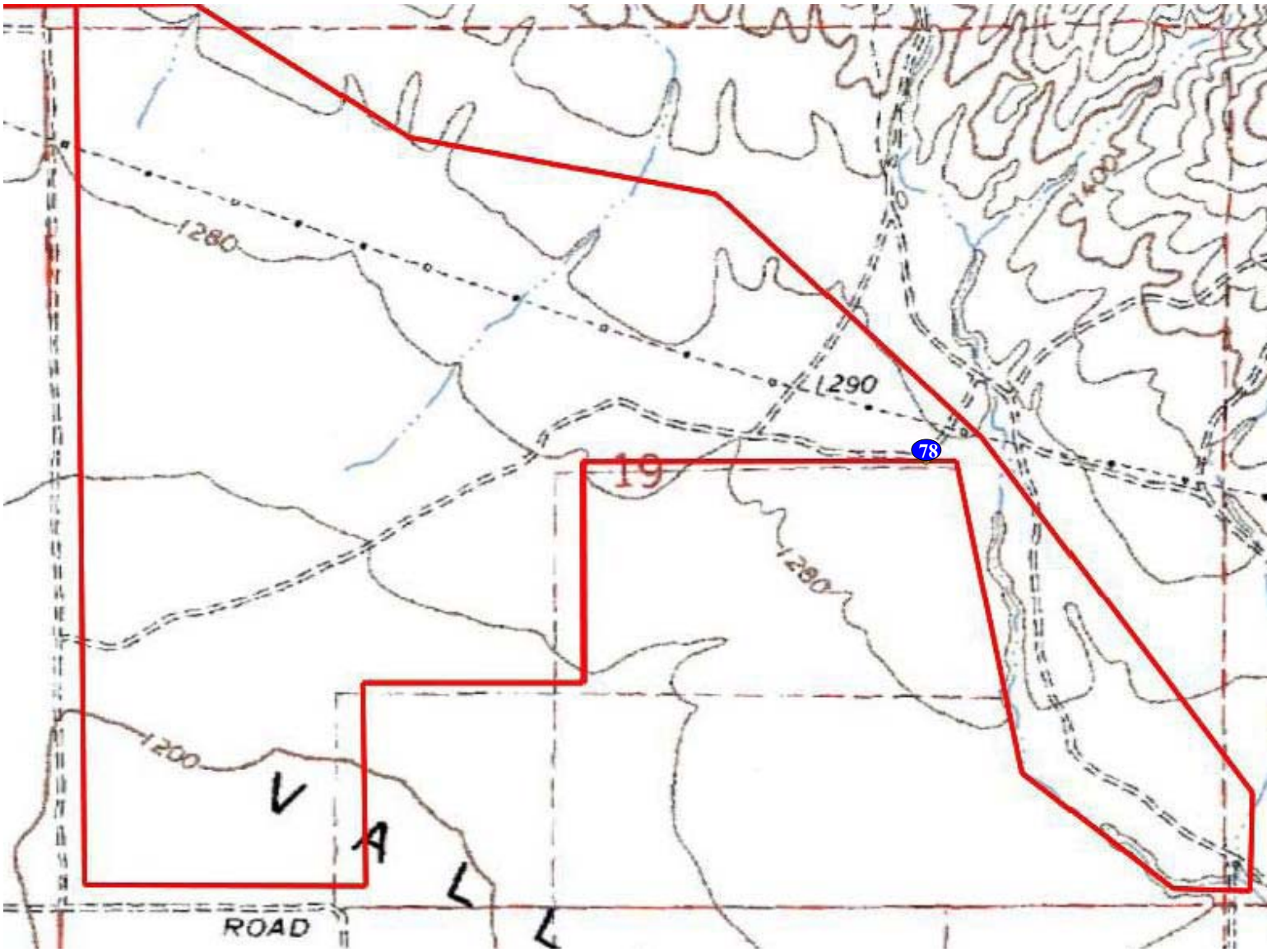
750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 16

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 16



LEGEND

- 68 Sampled Pools
- 68 *Branchinecta lynchi*
- 68 *Ambystoma californiense*
- Pools Converged Into One Pool
- Approximate Project Boundary

N

750' 0 750'

approximate scale

Live Oak Associates, Inc.

Pool Locations
Panoche Valley Solar Farm
Section 19

Date	Project #	Figure #
7/8/10	1297-06	3 - Section 19

3.3 Conclusion

Based on the results of the 2009/2010 wet season surveys, it has been determined that the Federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*) is present in one pool (Pool #12) on the PVSF project site. Incidental findings of California tiger salamander occurred in Pool #16 during the Branchiopod surveys.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Jeff Gurule

Signature:  . Date: August 13, 2010.

Permit # TE-168924

APPENDIX A:
AUTHORIZATION LETTERS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
81440-2010-CPA-0023

November 24, 2009

Michele Korpos
Senior Project Manager
Live Oak Associates, Inc.
6840 Via Del Oro, Suite 220
San Jose, California 95119

Subject: Authorization to Commence Aquatic Surveys for Vernal Pool Branchiopods at the Proposed Panoche Valley Solar Farm, San Benito County, California

Dear Ms. Korpos:

We have reviewed your request, dated November 11, 2009, and received by our office by electronic mail, to conduct aquatic larval surveys for federally listed vernal pool branchiopods, including the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*). You are requesting permission to conduct wet-season sampling at the proposed Panoche Valley Solar Project, San Benito County, California. The surveys will be conducted by Davianna Ohlson, Melissa Denena, Jeff Gurule, and/or Austin Pearson under the terms and conditions of their recovery permit (TE1670750-0, TE108681-0, TE168924-0, TE108683-0 respectively) and performed in accordance with the methods described in the U.S. Fish and Wildlife Service's Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods, April 1996.

We hereby authorize Davianna Ohlson, Melissa Denena, Jeff Gurule, and Austin Pearson to conduct the wet-season surveys. We remind them of their responsibilities in reporting survey results to us, regardless of findings, and suggest that they review the permit for any special conditions that must be met. If you have any questions, please contact Christopher Diel of my staff at (805) 644-1766, extension 305.

Sincerely,

for David M. Pereksta
Assistant Field Supervisor

Jeff Gurule

From: David_Kelly@fws.gov
Sent: Wednesday, November 12, 2008 7:59 AM
To: Jeff Gurule
Cc: Elizabeth_Warne@fws.gov; Josh_Hull@fws.gov
Subject: Re: Branchiopod Survey Data Sheet
Attachments: Data Sheet Template.xls

Jeff, the data sheet that you presented contains the information that we required in the protocol for the VPb surveys. You are authorized to use this survey form until otherwise notified. Thank you.

David Lee Kelly
Fish and Wildlife Biologist
Recovery Branch
US Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825
Ph. (916) 414-6492

Jeff Gurule <jgurule@loainc.com>

11/11/2008 04:38 PM

To <David_Kelly@fws.gov>
cc
Subject Branchiopod Survey Data Sheet

Hi David,

Last rainy season Live Oak Associates, Inc. conducted branchiopod surveys on three properties in Fresno County with numerous vernal pools on each (the largest containing 92 pools); this resulted in numerous data sheets (over a 1,000 pages of data sheets) submitted with our 90-day reports. Not only were these data sheets difficult to organize and proof, PDF's of the final reports were so huge it was difficult to email them with the data sheets attached. I believe that you expressed interest, yourself, in having us utilize an abbreviated data sheet for ease of handling and reviewing after seeing how many data sheets we had amassed in those surveys.

So, as Live Oak has authorization to conduct 2nd year surveys on properties we surveyed last year, plus additional properties not surveyed last year, I have created an EXCEL template to serve as our data sheet for all surveys conducted this year. I am submitting this template for your approval. I believe using this data sheet will greatly increase efficiency, present the data in a more useful format, and greatly reduce the potential for error.

I have included an explanation of codes that would be used in the Surveyors and Habitat Condition/Land Use columns. This explanation of codes would ultimately be located at the bottom of the EXCEL sheet.

I hope this is acceptable to you or that you have some suggestions on how to further simplify it. I hope to here back from you soon, as weather conditions may necessitate initiation of surveys soon.

Thanks,

Jeff Gurule
Project Manager
Wildlife/Wetland/Plant Ecologist

APPENDIX B:
2009/2010 WET SEASON SURVEY DATA

U.S. Fish and Wildlife Service Vernal Pool Data Sheet Wet Season Protocol Survey 2009/2010
Panoche Valley Solar Farm (1297-06), San Benito County, Cerro Colorado, Mercey Hot Springs, Llanada, & Panoche Quads, Township: 15S, Range: 10E & 11E

Fairy Shrimp ID Sheet 2009/2010
Panoche Valley Solar Farm (1297-06)

Pool #	Surveyers*	Date	Time (24hr)	Water Temp	Air Temp	Depth (cm)	Length (m)	Width (m)	Habitat Conditions/ Land Use*	Number of Shrimp in Pool	Number, Sex, Genus Collected	Notes	Number, Sex, Species IDed	Listed Species (x)	Date Identified	Identified By
1	JG, AP	12/21/09	854	9.0	11.0	7	2.0	1.0	CGH		0	trough pud.				
2	JG, AP	12/21/09	915	9.5	11.0	7	3.0	2.0	CGH		0					
3	JG, AP	12/21/09	931	9.0	11.0	7	3.0	2.0	CGH		0	road				
4	JG, AP	12/21/09	933	9.0	11.0	4	1.5	1.0	CGH		0	road				
5	JG, AP	12/21/09	935	8.5	11.0	11	8.0	2.0	CGH		0	vp				
6	JG, AP	12/21/09	942	9.5	11.0	3	2.0	0.5	CGH		0	rd				
7	JG, AP	12/21/09	947	10.0	11.0	3	2.0	1.0	CGH		0	rd				
8	JG, AP	12/21/09	1017	10.0	11.0	12	25.0	2.0	CGH		0	water tank pot. peren. pool				
9	JG, AP	12/21/09	1020	10.0	11.0	15	4.0	4.0	CGH		0	trough pud.				
10	JG, AP	12/21/09	1031	9.5	11.0	15	4.0	2.0	CGH		0	rd				
11	JG, AP	12/21/09	1037	10.0	11.0	7	2.0	1.0	CGH		0					
12	JG, AP	12/21/09	1040	11.0	11.0	4	0.5	0.5	CGH		0	burm pond				
13	JG, AP	12/21/09	1042	11.0	11.0	5	6.0	3.0	CGH		0					
14	JG, AP	12/21/09	1058	11.5	11.0	10	3.0	2.0	CGH		0	trough pud				
15	JG, AP	12/21/09	1100	12.5	11.0	6	3.0	2.0	CGH		0					
16	JG, AP	12/21/09	1115	11.0	11.0	20	9.0	3.0	CGH		0	burm pond				
17	JG, AP	12/21/09	1122	12.5	11.0	7	4.0	2.0	CGH		0	trough pond				
18	JG, AP	12/21/09	1132	11.5	11.0	10	40.0	2.0	CGH		0					
19	JG, AP	12/21/09	1138	11.0	11.0	7	2.0	1.0	CGH		0					
20	JG, AP	12/21/09	1143	12.5	11.0	6	1.0	0.5	CGH		0					
21	JG, AP	12/21/09	1148	10.0	11.0	20	3.0	1.0	CGH		0					
22	JG, AP	12/21/09	1232	12.5	11.0	10	1.0	0.5	CGH		0					
23	JG, AP	12/21/09	1234	12.5	11.0	15	8.0	1.0	CGH		0					
24	JG, AP	12/21/09	1244	12.0	11.0	21	3.0	2.0	CGH		0					
25	JG, AP	12/21/09	1246	13.0	11.0	10	2.0	1.0	CGH		0					
26	JG, AP	12/21/09	1249	13.0	11.0	14	1.0	0.5	CGH		0					
27	JG, AP	12/21/09	1257	12.5	11.0	12	7.0	2.0	CGH		0	trough pud.				
28	JG, AP	12/21/09	1306	13.5	11.0	8	1.0	0.5	CGH		0	rd				
29	JG, AP	12/21/09	1332	13.0	11.0	10	5.0	2.0	CGH		0	trough pond				
30	JG, AP	12/21/09	1339	13.0	11.0	11	1.5	1,5	CGH		0					
31	JG, AP	12/21/09	1430	13.5	11.0	6	2.0	1.0	CGH		0	trough pud				
32	JG, AP	12/21/09	1451	14.0	11.0	7	4.0	2.0	CGH		0					
33	JG, AP	12/21/09	1453	13.0	11.0	14	13.0	4.0	CGH		0					
34	JG, AP	12/21/09	1502	13.5	11.0	13	6.0	5.0	CGH		0					
35	JG, AP	12/21/09	1550	13.0	11.0	11	3.0	2.0	CGH		0	trough pud				
1	JG, GC	1/4/10	1124	14.0	11.0	7	5.0	2.0	CGH		0	trough pud				
2	JG, GC	1/4/10	1137	14.0	11.0	3	1.0	1.0	CGH		0					
3	JG, GC	1/4/10	1149	14.0	11.0	8	4.0	2.0	CGH		0	rd				
4	JG, GC	1/4/10	1150	15.0	11.0	4	2.0	1.5	CGH		0	rd				
5	JG, GC	1/4/10	1157	15.0	11.0	10	7.5	2.0	CGH		0	vp				
6	JG, GC	1/4/10	1205	15.5	11.0	6	5.5	1.0	CGH		0	rd				
7	JG, GC	1/4/10	1219	17.0	11.0	3	4.0	2.0	CGH		0	rd side				
8	JG, GC	1/4/10	1430	16.5	11.0	12	45.0	5.0	CGH		0	water tank pot. peren. pool				
9	JG, GC	1/4/10	1426	16.5	11.0	15	6.0	5.0	CGH		0	trough pud				
10	JG, GC	1/4/10	1346	15.0	11.0	12	4.0	2.0	CGH		0	rd				
11	JG, GC	1/4/10	1403	15.5	11.0	6	1.0	0.5	CGH		0					
12	JG, GC	1/4/10	1412			0			CGH		0					
13	JG, GC	1/4/10	1412	13.0	11.0	4	7.0	3.0	CGH		0	Hoof pocks				
14	JG, GC	1/4/10	1444	17.5	11.0	9	4.5	2.0	CGH		0	trough pud				
15	JG, GC	1/4/10	1447	16.0	11.0	7	4.0	2.0	CGH		0					
16	JG, GC	1/4/10	1454	16.5	11.0	19	9.5	4.0	CGH		0	burm pond				
17	JG, GC	1/4/10	1500	13.5	11.0	9	5.5	2.0	CGH		0	trough pond				
18	JG, GC	1/4/10	1510	16.0	11.0	13	42.5	2.0	CGH		0					
19	JG, GC	1/4/10	1524	13.0	11.0	7	1.5	1.5	CGH		0					

20	JG, GC	1/4/10	1520	15.0	11.0	5	4.0	2.0	CGH		0	rd side					
21	JG, GC	1/4/10	1528	14.5	9.0	18	4.0	1.0	CGH		0	rd side					
22	JG, GC	1/4/10	1540	13.5	9.0	5	1.0	0.5	CGH		0						
23	JG, GC	1/4/10	1541	15.0	9.0	7	8.0	1.0	CGH		0						
24	JG, GC	1/4/10	1557	14.5	9.0	15	5.0	2.0	CGH		0						
25	JG, GC	1/4/10	1557	11.5	9.0	7	3.0	1.5	CGH		0						
26	JG, GC	1/4/10	1601	11.5	9.0	5	4.5	1.0	CGH		0						
27	JG, GC	1/4/10	1607	13.0	9.0	14	8.0	7.0	CGH		0	trough pud					
28	JG, GC	1/4/10	1607			0			CGH		0	Dry					
36	JG, GC	1/4/10	1202	16.0	11.0	6	7.0	2.0	CGH		0	rd					
37	JG, GC	1/4/10	1207	15.0	11.0	5	6.0	2.0	CGH		0	rd					
38	JG, GC	1/4/10	1211	16.0	11.0	5	3.0	1.3	CGH		0	rd side					
39	JG, GC	1/4/10	1330	17.0	11.0	7	15.0	1.5	CGH		0	rd side					
40	JG, GC	1/4/10	1358	16.0	11.0	5	2.0	1.0	CGH		0	rd					
41	JG, GC	1/4/10	1400	17.0	11.0	4	4.0	2.0	CGH		0	rd					
42	JG, GC	1/4/10	1406	16.5	11.0	7	7.0	1.0	CGH		0	rd					
44	JG, GC	1/4/10	1538	14.0	9.0	5	2.0	0.5	CGH		0	rd					
45	JG, GC	1/4/10	1520	15.0	9.0	13	15.0	2.0	CGH		0						
28	JG, GC	1/5/10	1144	12.5	10.0	5	1.0	0.5	CGH		0	rd					
29	JG, GC	1/5/10	1121	8.0	10.0	10	5.5	3.0	CGH		0	trough pud					
30	JG, GC	1/5/10	1130	12.0	10.0	10	2.0	2.0	CGH		0						
31	JG, GC	1/5/10	1210	12.5	10.0	6	2.0	1.5	CGH		0	trough pud					
32	JG, GC	1/5/10	1254	14.0	14.0	4	2.0	0.5	CGH		0						
33	JG, GC	1/5/10	1259	16.0	14.0	14	16.0	3.0	CGH		0						
34	JG, GC	1/5/10	1315	15.0	14.0	15	8.0	5.0	CGH		0						
35	JG, GC	1/5/10	1403	16.0	14.0	13	4.5	4.0	CGH		0	trough pud					
46	JG, GC	1/5/10	1109	11.0	10.0	6	6.0	1.5	TT		0	rd					
47	JG, GC	1/5/10	1139	10.5	10.0	13	2.5	2.0	TT		0	rd					
48	JG, GC	1/5/10	1154	13.5	10.0	7	18.0	4.0	CGH		0	trough pud					
1	JG, GC	1/18/10	1214	9.5	9	8	18	13	CGH		0	trough pud					
2	JG, GC	1/18/10	1224	9.5	9	20	10	5	CGH		0						
3	JG, GC	1/18/10	1251	9.5	9	12	5	3	CGH		0	3,4.46 1 way flow connection					
4	JG, GC	1/18/10	1253	9.5	9	5	2.5	2.5	CGH		0	3,4.46 1 way flow connection					
5	JG, GC	1/18/10	1256	9.5	9	20	28	5	CGH		0	5,36,37 1 way flow connection					
7	JG, GC	1/18/10	1312	9.5	9	10	20	3.5	CGH		0						
8	JG, GC	1/18/10	1416	9.5	9	10	32	4	CGH		0						
9	JG, GC	1/18/10	1418	9.5	9	20	6.5	5.5	CGH		0						
10	JG, GC	1/18/10	1349	9.5	9	20	15	3	CGH		0						
11	JG, GC	1/18/10	1359	9.5	9	14	13	11	CGH		0						
12	JG, GC	1/18/10	1403	9.5	9	14	10	8	CGH		0						
13	JG, GC	1/18/10	1405	9.5	9	18	35	13	CGH		0						
14	JG, GC	1/18/10	1429	9.5	9	18	9	6	CGH		0						
15	JG, GC	1/18/10	1431	9.5	9	10	12	11	CGH		0						
16	JG, GC	1/18/10	1440	9.5	9	40	20	14	CGH		0						
17	JG, GC	1/18/10	1447	9.5	9	8	5	3	CGH		0						
18	JG, GC	1/18/10	1515	9.5	9	17	180	5	CGH		0						
19	JG, GC	1/18/10	1458	9.5	9	15	23	7	CGH		0						
20	JG, GC	1/18/10	1508	9.5	9	10	32	7	CGH		0						
21	JG, GC	1/18/10	1500	9.5	9	25	125	3	CGH		0						
37	JG, GC	1/18/10	1259	9.5	9	12	29	3	CGH		0	5,36,37 1 way flow connection					
38	JG, GC	1/18/10	1308	9.5	9	8	12	2	CGH		0						
39	JG, GC	1/18/10	1333	9.5	9	20	23	9	CGH		0						
40	JG, GC	1/18/10	1354	9.5	9	17	7.5	3	CGH		0						
41	JG, GC	1/18/10	1355	9.5	9	9	11	5	CGH		0						
42	JG, GC	1/18/10	1358	9.5	9	14	10	1	CGH		0						
46	JG, GC	1/18/10	1255	9.5	9	20	11	4	CGH		0	3,4.46 1 way flow connection					
36,6	JG, GC	1/18/10	1257	9.5	9	14	33	5	CGH		0	pools connected					
22	JG, GC	1/19/10	932	7	7	10	3	1	CGH		0						
23	JG, GC	1/19/10	933	7	7	15	11	2	CGH		0						

26	JG, GC	1/19/10	945	7	7	14	17	3	CGH		0					
27	JG, GC	1/19/10	953	7	7	27	15	15	CGH		0					
28	JG, GC	1/19/10	1030	7	7	15	9	4	CGH		0					
29	JG, GC	1/19/10	1142	7	7	14	7	4	CGH		0					
30	JG, GC	1/19/10	1129	7	7	25	3	3	CGH		0					
31	JG, GC	1/19/10	1050	7	7	15	4	4	CGH		0					
32	JG, GC	1/19/10	1113	7	7	34	9	4.5	CGH		0					
33	JG, GC	1/19/10	1115	7	7	35	29	8	CGH		0					
34	JG, GC	1/19/10	1105	7	7	39	13	9	CGH		0					
35	JG, GC	1/19/10	1225	7	7	17	5.5	4.5	CGH		0					
44	JG, GC	1/19/10	929	7	7	10	3	1	CGH		0					
45	JG, GC	1/19/10	936	7	7	19	20	2.5	CGH		0					
47	JG, GC	1/19/10	1029	7	7	19	4.5	4	CGH		0					
48	JG, GC	1/19/10	1037	7	7	10	4	4	CGH		0					
24,25	JG, GC	1/19/10	940	7	7	27	33	2.5	CGH		0	two pools connected				
1	JG, GC	2/1/10	1232	17	17	6	1.5	1.5	CGH		0					
2	JG, GC	2/1/10	1242	12	17	25	7	4	CGH		0					
3	JG, GC	2/1/10	1259	17	17	10	5	3	CGH		0					
4	JG, GC	2/1/10	1258	17	17	5	2.5	2	CGH		0					
5	JG, GC	2/1/10	1304	15	17	20	9	4.5	CGH		0					
6	JG, GC	2/1/10	1310	16.5	17	8	9	1.5	CGH		0					
7	JG, GC	2/1/10	1314	17	17	8	13	3	CGH		0					
8	JG, GC	2/1/10	1417	14	15	12	45	3	CGH		0					
9	JG, GC	2/1/10	1418	13	15	19	7.5	6	CGH		0					
10	JG, GC	2/1/10	1711	12.5	14	16	8	3	CGH		0					
11	JG, GC	2/1/10	1441	14.5	14	13	8	6	CGH		0					
12	JG, GC	2/1/10	1434	11.5	15	30	16	10	CGH		0					
13	JG, GC	2/1/10	1435	16	15	14	35	16	CGH		0					
14	JG, GC	2/1/10	1357	17.5	17	9	10	5.5	CGH		0					
15	JG, GC	2/1/10	1356	13	17	15	6	4.5	CGH		0					
16	JG, GC	2/1/10	1450	14	14	40	23	16	CGH		0					
17	JG, GC	2/1/10	1454	15	14	8	4	2	CGH		0					
18	JG, GC	2/1/10	1501	15.5	14	19	60	3	CGH		0					
19	JG, GC	2/1/10	1510	15	14	9	3	3	CGH		0					
20	JG, GC	2/1/10	1505	16	14	9	5	3	CGH		0					
21	JG, GC	2/1/10	1516	14	14	26	15	1.5	CGH		0					
22	JG, GC	2/1/10	1604	14.5	14	6	2	1	CGH		0					
23	JG, GC	2/1/10	1606	15	14	15	8	1	CGH		0					
26	JG, GC	2/1/10	1628	11	14	33	24	3	CGH		0					
27	JG, GC	2/1/10	1651	14	14	16	9	8	CGH		0					
36	JG, GC	2/1/10	1303	16.5	17	7	13	4.5	CGH		0					
37	JG, GC	2/1/10	1308	16.5	17	8	13	2.5	CGH		0					
38	JG, GC	2/1/10	1312	17	17	10	6	2	CGH		0					
39	JG, GC	2/1/10	1346	15.5	17	15	21	2.5	CGH		0					
40	JG, GC	2/1/10	1701	13	14	13	2	2	CGH		0					
41	JG, GC	2/1/10	1700	13.5	14	9	6	4.5	CGH		0					
42	JG, GC	2/1/10	1439	16	14	7	8	2	CGH		0					
43	JG, GC	2/1/10	1407	16	15	7	2	2	CGH		0	rd				
44	JG, GC	2/1/10	1556	14	14	6	1.5	0.5	CGH		0					
45	JG, GC	2/1/10	1607	15	14	13	16	2.5	CGH		0					
46	JG, GC	2/1/10	1256	16.5	17	8	8	2	CGH		0					
49	JG, GC	2/1/10	1251	16	17	10	4	0.5	CGH		0	rd				
50	JG, GC	2/1/10	1254	16	17	6	1.5	1.5	CGH		0	rd				
51	JG, GC	2/1/10	1316	16.5	17	5	4	2.5	CGH		0	rd				
52	JG, GC	2/1/10	1327	16.5	17	5	2	1.5	CGH		0	rd				
53	JG, GC	2/1/10	1339	16.5	17	8	3	2	CGH		0	rd				
54	JG, GC	2/1/10	1340	17	17	4	4	1	CGH		0	rd				
55	JG, GC	2/1/10	1342	18	17	5	2	1.5	CGH		0					
56	JG, GC	2/1/10	1405	16.5	15	6	1.5	1	CGH		0	rd				

57	JG, GC	2/1/10	1409	16	15	6	2	2	CGH		0	rd				
58	JG, GC	2/1/10	1427	16	15	9	6	1.5	CGH		0					
59	JG, GC	2/1/10	1459	16	14	9	4	2	CGH		0					
60	JG, GC	2/1/10	1520	16	14	70	32	24	CGH		6	collected unk invert				
61	JG, GC	2/1/10	1540	16	14	9	3	1	CGH		0					
62	JG, GC	2/1/10	1554	16	14	10	3.5	1	CGH		0					
63	JG, GC	2/1/10	1558	14.5	14	22	16	2	CGH		0					
64	JG, GC	2/1/10	1609	15	14	8	17	2.5	CGH		0					
65	JG, GC	2/1/10	1612	13	14	70+	73	35	CGH		0					
66	JG, GC	2/1/10	1616	14.5	14	11	2.5	2	CGH		0					
67	JG, GC	2/1/10	1621	14.5	14	9	14	0.25	CGH		0					
68	JG, GC	2/1/10	1630	14.5	14	9	14	2.5	CGH		0					
69	JG, GC	2/1/10	1634	12.5	14	23	27	21	CGH		0					
70	JG, GC	2/1/10	1636	14.5	14	9	9	2	CGH		0					
71	JG, GC	2/1/10	1645	12	14	25	82	3	CGH		0					
72	JG, GC	2/1/10	1647	13	14	33	59	6	CGH		0					
73	JG, GC	2/1/10	1439	13	14	6	3	2	CGH		0					
74	JG, GC	2/1/10	1703	13	14	7	5	2	CGH		0	rd				
75	JG, GC	2/1/10	1705	13	14	8	4	3	CGH		0	rd				
76	JG, GC	2/1/10	1707	13.5	14	6	3	1	CGH		0	rd				
77	JG, GC	2/1/10	1709	14	14	9	2	2	CGH		0	rd				
24,25	JG, GC	2/1/10	1626	13.5	14	30	38	3	CGH		0	combo				
28	JG, GC	2/2/10	1439	18	18	9	3	3	CGH		0					
29	JG, GC	2/2/10	1448	13.5	18	13	6.5	4	CGH		0					
30	JG, GC	2/2/10	1350	11	18	31	3	3	CGH		0					
31	JG, GC	2/2/10	1420	17	18	15	3	2	CGH		0					
32	JG, GC	2/2/10	1220	14	18	17	7	4	CGH		0					
33	JG, GC	2/2/10	1222	9	18	55	31	8	CGH		0					
34	JG, GC	2/2/10	1330	14	18	30	13	7	CGH		0					
35	JG, GC	2/2/10	1520	17.5	18	11	4	4	CGH		0					
47	JG, GC	2/2/10	1438	16	18	13	2.5	2	CGH		0					
48	JG, GC	2/2/10	1429	16	18	7	3	2	CGH		0					
78	JG, GC	2/2/10	1026	11.5	18	8	2.5	2	CGH		0					
79	JG, GC	2/2/10	1129	14.5	18	10	3	1	CGH		0					
80	JG, GC	2/2/10	1134	9.5	18	55	20	5	CGH		0					
81	JG, GC	2/2/10	1137	11.5	18	8	6	2.5	CGH		0					
82	JG, GC	2/2/10	1143	18	18	5	3	1	CGH		0					
83	JG, GC	2/2/10	1145	17.5	18	6	3	1	CGH		0					
84	JG, GC	2/2/10	1147	15	18	14	1.5	2	CGH		0					
85	JG, GC	2/2/10	1156	14.5	18	20	30	2.5	CGH		0					
86	JG, GC	2/2/10	1201	15	18	17	12	2.5	CGH		0					
87	JG, GC	2/2/10	1211	17.5	18	9	1.5	1.5	CGH		0					
88	JG, GC	2/2/10	1213	12	18	47	8	5.5	CGH		0					
89	JG, GC	2/2/10	1216	13.5	18	30	13.5	4	CGH		0					
90	JG, GC	2/2/10	1302	16	18	25	30	12	CGH		0					
91	JG, GC	2/2/10	1337	19	18	10	3	1.5	CGH		0					
92	JG, GC	2/2/10	1400	17.5	18	11	10	7	CGH		0	trough pud				
93	JG, GC	2/2/10	1409	16	18	9	4	4	CGH		0	trough pud				
94	JG, GC	2/2/10	1419	19	18	9	1.5	1	CGH		0					
95	JG, GC	2/2/10	1445	18.5	18	7	16	0.5	CGH		0					
96	JG, GC	2/2/10	1026	14	18	13	4	4	CGH		0	trough pud				
2	JG, GC	2/16/10	1453	16.5	18.5	30	9.5	5	CGH		0					
3	JG, GC	2/16/10	1537	19	18.5	9	4	2.5	CGH		0					
4	JG, GC	2/16/10	1538	20	18.5	4	2	1.5	CGH		0					
5	JG, GC	2/16/10	1535	20.5	18.5	21	10	4	CGH		0					
6	JG, GC	2/16/10	1531	20	18.5	7	5	1.5	CGH		0					
7	JG, GC	2/16/10	1527	21	18.5	5	5	2.5	CGH		0					
8	JG, GC	2/16/10	1627	16	18.5	12	45	2.5	CGH		0					
9	JG, GC	2/16/10	1629	17	18.5	19	7	7	CGH		0					

10	JG, GC	2/16/10	1547	17	18.5	17	6	2.5	CGH		0						
11	JG, GC	2/16/10	1611	15	18.5	19	8	6	CGH		0						
12	JG, GC	2/16/10	1617	18	18.5	33	17	15	CGH		0						
13	JG, GC	2/16/10	1615	20	18.5	18	38	19	CGH		0						
14	JG, GC	2/16/10	1640	16	18.5	18	6	5	CGH		0						
15	JG, GC	2/16/10	1642	19	18.5	9	6.5	9	CGH		0						
16	JG, GC	2/16/10	1651	18	18.5	40	24.5	17	CGH		0						
17	JG, GC	2/16/10	1655	14.5	18.5	6	3	1	CGH		0						
36	JG, GC	2/16/10	1534	20	18.5	11	6	3	CGH		0						
37	JG, GC	2/16/10	1533	20	18.5	11	6	2	CGH		0						
38	JG, GC	2/16/10	1529	18.5	18.5	5	3	1.5	CGH		0						
39	JG, GC	2/16/10	1517	21.5	18.5	10	21	3	CGH		0						
40	JG, GC	2/16/10	1604	19	18.5	11	1.5	1	CGH		0						
41	JG, GC	2/16/10	1606	19	18.5	6	4	4	CGH		0						
42	JG, GC	2/16/10	1609	17.5	18.5	5	2	1	CGH		0						
46	JG, GC	2/16/10	1539	20	18.5	7	5	2	CGH		0						
49	JG, GC	2/16/10	1444	20.5	18.5	6	2	0.25	CGH		0						
53	JG, GC	2/16/10	1505	18.5	18.5	7	2.5	2	CGH		0						
54	JG, GC	2/16/10	1507	20	18.5	4	3	1	CGH		0						
55	JG, GC	2/16/10	1514	21	18.5	4	2	1.5	CGH		0						
58	JG, GC	2/16/10	1621	18	18.5	6	3	0.75	CGH		0						
74	JG, GC	2/16/10	1555	20	18.5	7	5	2.5	CGH		0						
75	JG, GC	2/16/10	1551	19.5	18.5	7	4	2	CGH		0						
76	JG, GC	2/16/10	1549	19	18.5	4	2.5	0.75	CGH		0						
78	JG, GC	2/16/10	1353	21	18.5	10	2.5	2	CGH		0						
79	JG, GC	2/16/10	1421	20	18.5	15	5	1.5	CGH		0						
97	JG, GC	2/16/10	1419	22	18.5	6	1.5	0.5	CGH		0						
98	JG, GC	2/16/10	1422	22.5	18.5	5	3	0.5	CGH		0						
99	JG, GC	2/16/10	1425	22.5	18.5	9	4	1	CGH		0						
100	JG, GC	2/16/10	1510	20	18.5	9	2.5	2	CGH		0						
101	JG, GC	2/16/10	1553	20	18.5	5	6.5	1	CGH		0						
18	JG, GC	2/17/10	1112	16	19	13	52	4	CGH		0						
19	JG, GC	2/17/10	1125	16	19	14	3	3	CGH		0						
20	JG, GC	2/17/10	1120	19	19	9	4	3	CGH		0						
21	JG, GC	2/17/10	1128	13.5	19	23	9.5	2	CGH		0	collected unk invert					
22	JG, GC	2/17/10	1208	20	19	11	1.5	0.75	CGH		0						
23	JG, GC	2/17/10	1210	20.5	19	11	7	1.5	CGH		0						
26	JG, GC	2/17/10	1231	12.5	19	33	25	5	CGH		0						
27	JG, GC	2/17/10	1248	21	19	7	9	6	CGH		0						
28	JG, GC	2/17/10	1500	21	19	8	3	2	CGH		0						
29	JG, GC	2/17/10	1455	17	19	11	6.5	4.5	CGH		0						
30	JG, GC	2/17/10	1635	13	19	33	3.5	3.5	CGH		0						
31	JG, GC	2/17/10	1518	22	19	5	2	1	CGH		0						
32	JG, GC	2/17/10	1618	22	19	19	7	3	CGH		0						
33	JG, GC	2/17/10	1620	13.5	19	51	31	9	CGH		0						
34	JG, GC	2/17/10	1630	16	19	31	14	9	CGH		0						
44	JG, GC	2/17/10	1205	20	19	9	2	0.33	CGH		0						
45	JG, GC	2/17/10	1212	21	19	12	17	3.5	CGH		0						
47	JG, GC	2/17/10	1501	20.5	19	12	3	3	CGH		0						
48	JG, GC	2/17/10	1510	21.5	19	8	4	2	CGH		0						
59	JG, GC	2/17/10	1103	17.5	19	9	5	2	CGH		0						
60	JG, GC	2/17/10	1145	12.5	19	70+	31	26	CGH		0						
62	JG, GC	2/17/10	1202	19.5	19	11	5	1.5	CGH		0						
63	JG, GC	2/17/10	1203	17	19	27	19	2.5	CGH		0						
64	JG, GC	2/17/10	1214	21	19	7	10	2	CGH		0						
65	JG, GC	2/17/10	1217	17.5	19	70+	75	36	CGH		0	unk invert					
66	JG, GC	2/17/10	1226	16.5	19	15	4	2	CGH		0						
68	JG, GC	2/17/10	1233	20	19	7	14	2.5	CGH		0						
69	JG, GC	2/17/10	1237	16.5	19	14	25	19	CGH		0						

70	JG, GC	2/17/10	1235	21.5	19	7	6	1.5	CGH		0					
71	JG, GC	2/17/10	1240	17	19	26	80	4	CGH		0					
72	JG, GC	2/17/10	1245	13.5	19	36	56	5	CGH		0					
73	JG, GC	2/17/10	1250	21	19	4	1	1	CGH		0					
80	JG, GC	2/17/10	1532	14.5	19	43	17	5	CGH		0					
81	JG, GC	2/17/10	1534	22	19	15	12	4	CGH		0					
82	JG, GC	2/17/10	1538	23.5	19	8	5	1.5	CGH		0					
83	JG, GC	2/17/10	1540	23.5	19	8	5.5	1.5	CGH		0					
84	JG, GC	2/17/10	1542	22.5	19	13	17	2	CGH		0					
85	JG, GC	2/17/10	1550	20	19	19	24	2.5	CGH		0					
86	JG, GC	2/17/10	1610	20	19	17	12	2	CGH		0					
88	JG, GC	2/17/10	1615	15.5	19	44	8	6	CGH		0					
89	JG, GC	2/17/10	1617	19.5	19	21	12	5	CGH		0					
90	JG, GC	2/17/10	1626	22.5	19	22	30	12	CGH		0					
92	JG, GC	2/17/10	1643	18	19	13	12	7	CGH		0					
93	JG, GC	2/17/10	1523	21	19	7	4	3	CGH		0					
96	JG, GC	2/17/10	1444	18	19	17	6	5	CGH		0					
102	JG, GC	2/17/10	1200	25	19	4	6	1	CGH		0					
24,25	JG, GC	2/17/10	1228	12	19	30	39	3	CGH		0					
1	JG, AP	3/2/10	1238	14	12	6	1	1			0					
2	JG, AP	3/2/10	1246	13	12	34	7	3			0					
3	JG, AP	3/2/10	1311	14	12	11	4	3			0					
4	JG, AP	3/2/10	1308	14	12	5	1.5	1			0					
5	JG, AP	3/2/10	1314	13.5	12	25	9	4			0					
6	JG, AP	3/2/10	1319	14	12	9	5	1			0					
7	JG, AP	3/2/10	1410	15.5	12	8	11	2			0					
8	JG, AP	3/2/10	1518	15	12	16	19	2			0					
9	JG, AP	3/2/10	1520	14	12	20	5	4			0					
10	JG, AP	3/2/10	1426	15	12	20	7	2			0					
11	JG, AP	3/2/10	1448	15	12	22	7	6			0					
12	JG, AP	3/2/10	1450	13	12	35	4	8			0					
13	JG, AP	3/2/10	1453	14	12	18	32	9			0					
14	JG, AP	3/2/10	1553	13.5	12	18	5	4			0					
15	JG, AP	3/2/10	1551	15	12	10	7	6			0					
16	JG, AP	3/2/10	1604	13	12	57	23	21			0	1 cts larva				
17	JG, AP	3/2/10	1418	13.5	12	8	3	1			0					
36	JG, AP	3/2/10	1316	14	12	9	7	2			0					
37	JG, AP	3/2/10	1318	14	12	6	9	2			0					
38	JG, AP	3/2/10	1413	15.5	12	12	3	2			0					
39	JG, AP	3/2/10	1358	15	12	16	18	4			0					
40	JG, AP	3/2/10	1442	15	12	16	2	2			0					
41	JG, AP	3/2/10	1444	15	12	12	3	2			0					
42	JG, AP	3/2/10	1446	15	12	9	7	1			0					
43	JG, AP	3/2/10	1529	14	12	7	2	1			0					
46	JG, AP	3/2/10	1304	14	12	8	6	1			0					
49	JG, AP	3/2/10	1212	13.5	12	17	18	1			0					
50	JG, AP	3/2/10	1218	13.5	12	7	4	0.5			0					
51	JG, AP	3/2/10	1412	16.5	12	3	1.5	1.1			0					
52	JG, AP	3/2/10	1344	16	12	6	2	2			0					
53	JG, AP	3/2/10	1346	17	12	10	4	3			0					
54	JG, AP	3/2/10	1348	17.5	12	8	6	1			0					
55	JG, AP	3/2/10	1354	17	12	10	5	2			0					
56	JG, AP	3/2/10	1533	14	12	6	2	0.5			0					
57	JG, AP	3/2/10	1501	15	12	7	3	2			0					
58	JG, AP	3/2/10	1458	14.5	12	9	5	1			0					
74	JG, AP	3/2/10	1438	15	12	10	5	2			0					
75	JG, AP	3/2/10	1432	15.5	12	9	4	2			0					
76	JG, AP	3/2/10	1429	15	12	6	3	1			0					
77	JG, AP	3/2/10	1430	15	12	10	1	1			0					

100	JG, AP	3/2/10	1353	16.5	12	11	2	2			0					
101	JG, AP	3/2/10	1434	15.5	12	7	7	2			0					
103	JG, AP	3/2/10	1230	14	12	10	2	1	cgh		0	rd				
104	JG, AP	3/2/10	1403	16	12	9	4	4	cgh		0					
105	JG, AP	3/2/10	1421	15	12	10	14	8	cgh		0					
106	JG, AP	3/2/10	1441	15	12	9	4	1.5			0	rd				
18	JG, AP	3/3/10	1359	11.5	10	25	44	1.5			0					
19	JG, AP	3/3/10	1410	11	10	18	5	1			0					
20	JG, AP	3/3/10	1406	12	10	10	4	3			0					
21	JG, AP	3/3/10	1414	11	10	33	15	1			0					
26	JG, AP	3/3/10	1520	11	10	41	22	2			0					
27	JG, AP	3/3/10	1552	13.5	10	17	8	4			0					
28	JG, AP	3/3/10	1211	12	10	12	3	2			0					
29	JG, AP	3/3/10	1224	12	10	12	5	2			0					
30	JG, AP	3/3/10	1134	10	10	37	3	3			0					
31	JG, AP	3/3/10	1155	10	10	8	2	1			0					
32	JG, AP	3/3/10	1056	9	10	20	6	3			0					
33	JG, AP	3/3/10	1101	9.5	10	50+	30	8			0					
34	JG, AP	3/3/10	1125	9.5	10	40	11	4			0					
35	JG, AP	3/3/10	1330	13	10	4	3	1			0					
44	JG, AP	3/3/10	1454	12	10	11	2	0.5			0					
47	JG, AP	3/3/10	1209	10	10	18	3	2			0					
59	JG, AP	3/3/10	1356	12.5	10	13	11	5			0					
60	JG, AP	3/3/10	1420	10	10	50+	29	y			0					
61	JG, AP	3/3/10	1428	11	10	14	3	1			0					
62	JG, AP	3/3/10	1448	12.5	10	20	4	1			0					
63	JG, AP	3/3/10	1452	11.5	10	31	18	2			0					
66	JG, AP	3/3/10	1511	12.5	10	18	3	1			0					
67	JG, AP	3/3/10	1506	12	10	6	7	0.5			0					
68	JG, AP	3/3/10	1523	14	10	13	12	2			0					
69	JG, AP	3/3/10	1526	11.5	10	45	37	20			0					
70	JG, AP	3/3/10	1530	14	10	11	9	1			0					
71	JG, AP	3/3/10	1534	11	10	32	72	2			0					
72	JG, AP	3/3/10	1540	11	10	43	55	4			0					
73	JG, AP	3/3/10	1554	13.5	10	14	3	2			0					
78	JG, AP	3/3/10	903	7.5	10	13	2	2			0					
79	JG, AP	3/3/10	952	9	10	20	5	1			0					
80	JG, AP	3/3/10	1013	9	10	49	16	4			0					
81	JG, AP	3/3/10	1017	9	10	22	10	3			0					
82	JG, AP	3/3/10	1022	10	10	11	6	1			0					
83	JG, AP	3/3/10	1027	10	10	14	5	1			0					
84	JG, AP	3/3/10	1028	10	10	23	16	2			0					
85	JG, AP	3/3/10	1036	9.5	10	34	34	3			0					
86	JG, AP	3/3/10	1041	9.5	10	30	23	2			0					
88	JG, AP	3/3/10	1045	8.5	10	47	7	5			0					
89	JG, AP	3/3/10	1054	9	10	33	17	4			0					
90	JG, AP	3/3/10	1115	9.5	10	30	30	7			0					
91	JG, AP	3/3/10	1129	10	10	14	3	1			0					
92	JG, AP	3/3/10	1215	12	10	5	3	2			0					
93	y	3/3/10	1150	10	10	12	3	2			0					
94	JG, AP	3/3/10	1156	10	10	9	1	1			0					
95	JG, AP	3/3/10	1220	12.5	10	12	17	1			0					
96	JG, AP	3/3/10	1333	12.5	10	16	4	4			0					
97	JG, AP	3/3/10	950	9	10	13	3	1			0					
98	JG, AP	3/3/10	954	9	10	12	16	1			0					
99	JG, AP	3/3/10	957	9	10	18	19	0.5			0					
102	JG, AP	3/3/10	1432	12	10	11	5	1			0					
107	JG, AP	3/3/10	924	8.5	10	10	4	1	cgh		0	swale				
108	JG, AP	3/3/10	926	8.5	10	13	3	0.5	cgh		0	swale				

109	JG, AP	3/3/10	929	9	10	12	3	1	cgh		0	swale					
110	JG, AP	3/3/10	931	8.5	10	19	9	1	cgh		0	swale					
111	JG, AP	3/3/10	934	9	10	15	11	1	cgh		0	swale					
112	JG, AP	3/3/10	936	9	10	16	8	1	cgh		0	swale					
113	JG, AP	3/3/10	938	9	10	17	4	1	cgh		0	swale					
114	JG, AP	3/3/10	942	9	10	12	10	1	cgh		0	swale					
115	JG, AP	3/3/10	956	9	10	8	3	0.5	cgh		0	swale					
116	JG, AP	3/3/10	1000	9	10	15	8	1	cgh		0	swale					
117	JG, AP	3/3/10	1019	9	10	7	15	1	cgh		0	swale					
118	JG, AP	3/3/10	1025	10	10	11	3	1	cgh		0	swale					
119	JG, AP	3/3/10	1034	9.5	10	17	48	3	cgh		0	swale					
120	JG, AP	3/3/10	1039	10	10	12	20	0.5	cgh		0	swale					
121	JG, AP	3/3/10	1110	9.5	10	23	26	8	cgh		0	swale					
122	JG, AP	3/3/10	1121	10	10	15	40	8	cgh		0	swale					
123	JG, AP	3/3/10	1337	13	10	9	5	4	cgh		0	swale					
124	JG, AP	3/3/10	1436	12.5	10	15	3	1	cgh		0	swale					
125	JG, AP	3/3/10	1440	12.5	10	14	5	1	cgh		0	swale					
126	JG, AP	3/3/10	1442	13	10	13	5	0.5	cgh		0	swale					
127	JG, AP	3/3/10	1450	12.5	10	15	5	1	cgh		0	swale					
2,23,45,64,65	JG, AP	3/3/10	1500	10	10	100+	140	40			0	pools combined					
24,25	JG, AP	3/3/10	1514	11.5	10	35	34	2			0						
2	JG, GC	3/16/10	1045	12.5	21	33	7	5									
3	JG, GC	3/16/10	1139	20	21	6	4	2									
5	JG, GC	3/16/10	1132	16	21	13	10	3									
8	JG, GC	3/16/10	1308	24.5	21	14	53	4									
9	JG, GC	3/16/10	1310	20	21	11	6.5	5									
10	JG, GC	3/16/10	1148	17	21	14	4.5	2									
11	JG, GC	3/16/10	1158	16	21	16	6	5									
12	JG, GC	3/16/10	1203	12.5	21	30	17	10		100s	4,Male,Branc		4, Male, *Branchinecta Lynchi*	x	3/18/2010	JG	
13	JG, GC	3/16/10	1200	18	21	17	32	13									
14	JG, GC	3/16/10	1319	17	21	14	6	6									
15	JG, GC	3/16/10	1321	24.5	21	5	3.5	2									
16	JG, GC	3/16/10	1330	19	21	50	25	5				2 CTS Larva					
18	JG, GC	3/16/10	1045	24	21	13	47	2									
19	JG, GC	3/16/10	1409	19	21	12	1	0.5									
21	JG, GC	3/16/10	1411	19	21	24	7	2									
26	JG, GC	3/16/10	1530	16.5	21	21	24	3									
27	JG, GC	3/16/10	1607	23	21	7	7	5									
29	JG, GC	3/16/10	1626	21.5	21	11	7	4									
37	JG, GC	3/16/10	1130	21	21	4	7	5									
39	JG, GC	3/16/10	1109	18	21	5	14	2.5									
41	JG, GC	3/16/10	1154	22	21	3	3	2.5									
42	JG, GC	3/16/10	1156	22	21	3	2	0.5									
47	JG, GC	3/16/10	1635	20	21	13	3	2									
59	JG, GC	3/16/10	1350	24.5	21	6	2	1									
60	JG, GC	3/16/10	1416	13	21	75+	35	27									
62	JG, GC	3/16/10	1443	27	21	6	3	0.5									
63	JG, GC	3/16/10	1445	20	21	23	16	2									
66	JG, GC	3/16/10	1516	15	21	9	2.5	5									
68	JG, GC	3/16/10	1535	23.5	21	7	10	2									
69	JG, GC	3/16/10	1541	24	21	15	23	17									
70	JG, GC	3/16/10	1603	25	21	5	3	0.5									
71	JG, GC	3/16/10	1545	16	21	30	81	4									
72	JG, GC	3/16/10	1601	19	21	30	60	5									
74	JG, GC	3/16/10	1152	22	21	3	7	5									
23,45,64,65	JG, GC	3/16/10	1455	14	21	75+	103	84									
24,25	JG, GC	3/16/10	1519	20	21	21	34	2.5									
30	JG, GC	3/17/10	1144	13	21	32	3.5	3.5									
33	JG, GC	3/17/10	1122	11.5	21	75+	33	7.5									

34	JG, GC	3/17/10	1137	13	21	30	11.5	8								
80	JG, GC	3/17/10	1050	12	21	23	7	3.5								
81	JG, GC	3/17/10	1055	19	21	7	3.5	1.5								
85	JG, GC	3/17/10	1105	14	21	18	30	2.5								
85	JG, GC	3/17/10	1118	18	21	11	6	2.5								
86	JG, GC	3/17/10	1109	16	21	14	9	2								
88	JG, GC	3/17/10	1113	11	21	37	7	4.5								
89	JG, GC	3/17/10	1116	13	21	22	10	3.5								
90	JG, GC	3/17/10	1130	13	21	25	29	12								
92	JG, GC	3/17/10	1211	22	21	6	6	6								
96	JG, GC	3/17/10	1228	19	21	15	4	4								
2	JG,AP	3/30/10	1007	14	13	19	4	3		0						
8	JG,AP	3/30/10	1057	15	13	8	17	2		0						
12	JG,AP	3/30/10	1049	13	13	21	11	5		0						
13	JG,AP	3/30/10	1043	15	13	8	13	4		0						
14	JG,AP	3/30/10	1105	13.5	13	3	2	0.5		0						
16	JG,AP	3/30/10	1115	13.5	13	45	21	12		0		10 cts larva				
24	JG,AP	3/30/10	1206	16.5	13	6	2	1		0						
25	JG,AP	3/30/10	1208	13.5	13	16	14	2		0						
26	JG,AP	3/30/10	1211	14	13	20	18	2		0						
29	JG,AP	3/30/10	1252	17.5	13	10	5	2		0						
30	JG,AP	3/30/10	1310	17	13	19	3	3		0						
33	JG,AP	3/30/10	1327	13	13	65	25	10		0						
34	JG,AP	3/30/10	1315	16.5	13	20	8	7		0						
60	JG,AP	3/30/10	1128	12	13	71	25	15		0						
63	JG,AP	3/30/10	1145	15.5	13	15	8	1		0						
69	JG,AP	3/30/10	1216	15	13	15	4	3		0		all hoof prints				
71	JG,AP	3/30/10	1219	14.5	13	19	66	2		0						
72	JG,AP	3/30/10	1225	14.5	13	23	29	3		0						
80	JG,AP	3/30/10	1349	19	13	4	2	1		0						
85	JG,AP	3/30/10	1340	19	13	12	14	1		0						
88	JG,AP	3/30/10	1334	14.5	13	34	4	4		0						
89	JG,AP	3/30/10	1333	17	13	15	6	1		0						
90	JG,AP	3/30/10	1320	17.5	13	20	21	9		0						
45,64,65	JG,AP	3/30/10	1152	12.5	13	75+	88	32		0						
1	GC,JG	4/13/10	1355	27.5	16	5	3	1								
2	GC,JG	4/13/10	1405	19	16	26	10	4								
3	GC,JG	4/13/10	1456	21.5	16	10	6	3								
4	GC,JG	4/13/10	1457	21.5	16	8	4	3								
5	GC,JG	4/13/10	1454	21	16	20	22	4.5								
6	GC,JG	4/13/10	1448	27.5	16	7	10	2								
7	GC,JG	4/13/10	1445	25	16	9	15	3								
8	GC,JG	4/13/10	1602	19.5	16	13	60	3								
9	GC,JG	4/13/10	1604	19.5	16	15	5.5	5								
10	GC,JG	4/13/10	1511	24	16	21	10	3								
11	GC,JG	4/13/10	1545	22	16	9	5	4								
12	GC,JG	4/13/10	1548	27.5	16	25	16	8								
13	GC,JG	4/13/10	1546	21	16	11	22	8								
14	GC,JG	4/13/10	1612	19.5	16	15	6	4.5								
15	GC,JG	4/13/10	1617	22	16	7	9	5.5								
16	GC,JG	4/13/10	1621	18	16	40	24	15				Clam shrimp, 4 CTS				
17	GC,JG	4/13/10	1633	19.5	16	6	5	2								
18	GC,JG	4/13/10	1638	19.5	16	14	52	2								
19	GC,JG	4/13/10	1646	17.5	16	16	5	4								
20	GC,JG	4/13/10	1644	19	16	8	5	3								
21	GC,JG	4/13/10	1648	13.5	16	26	16	1.5								
29	GC,JG	4/13/10	1500	23.5	16	14	6.5	4								
36	GC,JG	4/13/10	1452	27.5	16	15	27	4								
37	GC,JG	4/13/10	1450	27.5	16	15	14	2.5								

38	GC,JG	4/13/10	1447	25	16	10	8	2.5									
39	GC,JG	4/13/10	1423	27	16	17	24	7									
40	GC,JG	4/13/10	1523	22	16	18	2.5	2.5									
41	GC,JG	4/13/10	1524	22.5	16	7	6	5									
42	GC,JG	4/13/10	1544	22.5	16	10	9	4									
43	GC,JG	4/13/10	1610	20	16	8	1.5	1									
46	GC,JG	4/13/10	1458	25.5	16	7	9.5	3									
49	GC,JG	4/13/10	1350	23.5	16	11	13	0.5									
50	GC,JG	4/13/10	1347	26	16	12	70	2									
50	GC,JG	4/13/10	1347	26	16	12	70	2									
52	GC,JG	4/13/10	1420	27	16	5	4	4									
53	GC,JG	4/13/10	1426	27.5	16	9	3	2									
54	GC,JG	4/13/10	1428	27.5	16	8	9	2									
55	GC,JG	4/13/10	1433	26	16	10	5	2.5									
56	GC,JG	4/13/10	1608	20	16	6	1.5	0.5									
57	GC,JG	4/13/10	1611	20	16	9	1	1									
60	GC,JG	4/13/10	1654	14	16	75+	28	23									
61	GC,JG	4/13/10	1700	17	16	7	2	0.5									
74	GC,JG	4/13/10	1520	25	16	10	7	3									
75	GC,JG	4/13/10	1517	26	16	9	6	3.5									
76	GC,JG	4/13/10	1515	25.5	16	9	7	1									
77	GC,JG	4/13/10	1513	25	16	12	3	3									
100	GC,JG	4/13/10	1430	26	16	10	3	2.5									
101	GC,JG	4/13/10	1518	25.5	16	9	9	2									
104	GC,JG	4/13/10	1416	27.5	16	6	5	5									
106	GC,JG	4/13/10	1522	23.5	16	13	5	2									
22	GC,JG	4/14/10	1000	14	15	7	2	0.5									
23	GC,JG	4/14/10	1001	14.5	15	12	7	1									
24	GC,JG	4/14/10	1031	13.5	15	16	15	3									
25	GC,JG	4/14/10	1033	12	15	18	12	1.5									
26	GC,JG	4/14/10	1035	14	15	20	20.5	2									
27	GC,JG	4/14/10	1113	15.5	15	18	9	8									
28	GC,JG	4/14/10	1641	19	15	7	2	1									
30	GC,JG	4/14/10	1618	16	15	23	2.5	2.5									
32	GC,JG	4/14/10	1556	18	15	20	7	5									
33	GC,JG	4/14/10	1557	13	15	63	30	8									
34	GC,JG	4/14/10	1610	16	15	30	10	7									
35	GC,JG	4/14/10	1657	16.5	15	9	4	3									
44	GC,JG	4/14/10	958	14	15	9	2	0.5									
47	GC,JG	4/14/10	1642	19.5	15	18	3	3									
62	GC,JG	4/14/10	954	16	15	6	2.5	0.5									
63	GC,JG	4/14/10	956	12.5	15	17	14.5	1.5									
68	GC,JG	4/14/10	1045	12.5	15	13	13	2									
69	GC,JG	4/14/10	1052	17.5	15	10	20	3									
70	GC,JG	4/14/10	1054	17	15	9	7.5	1									
71	GC,JG	4/14/10	1100	14	15	22	71	3									
72	GC,JG	4/14/10	1105	14.5	15	21	33	4.5									
73	GC,JG	4/14/10	1115	20.5	15	6	1.5	0.5									
78	GC,JG	4/14/10	1432	21.5	15	13	3	3									

79	GC,JG	4/14/10	1513	19	15	12	5	1.5									
85	GC,JG	4/14/10	1542	20	15	16	24	2									
86	GC,JG	4/14/10	1547	18	15	17	11	2									
88	GC,JG	4/14/10	1549	16.5	15	26	5	4									
89	GC,JG	4/14/10	1555	19.5	15	21	10	3.5									
90	GC,JG	4/14/10	1604	20	15	13	25	9									
91	GC,JG	4/14/10	1613	18	15	15	4	2									
92	GC,JG	4/14/10	1644	17.5	15	10	6	5									
95	GC,JG	4/14/10	1649	20	15	14	44	1.5									
96	GC,JG	4/14/10	1659	18.5	15	15	5	5									
97	GC,JG	4/14/10	1512	19	15	12	3.5	1.5									
98	GC,JG	4/14/10	1514	21	15	7	6.5										
99	GC,JG	4/14/10	1524	20	15	13	10	0.5									
109	GC,JG	4/14/10	1500	21.5	15	11	3	1									
111	GC,JG	4/14/10	1502	20	15	10	4	1									
112	GC,JG	4/14/10	1505	20.5	15	10	9	1									
113	GC,JG	4/14/10	1508	18	15	15	6	1.5									
114	GC,JG	4/14/10	1511	19	15	9	8	1									
115	GC,JG	4/14/10	1522	19	15	10	4	0.5									
116	GC,JG	4/14/10	1526	20	15	7	2.5	0.5									
123	GC,JG	4/14/10	1703	19	15	9	4	2.5									
128	GC,JG	4/14/10	1454	22	15	10	5	1									
45,64,65	GC,JG	4/14/10	1002	12	15	75+	86	83									
2	GC, JG	4/27/10	1418	20	24	16	4	3									
5	GC, JG	4/27/10	1450	21	24	14	8	3									
7	GC, JG	4/27/10	1445	23	24	4	1	0.5									
8	GC, JG	4/27/10	1517	23	24	7	59	4									
10	GC, JG	4/27/10	1456	26	24	9	3.5	2									
12	GC, JG	4/27/10	1504	22	24	21	12	8.5									
16	GC, JG	4/27/10	1539	18.5	24	39	21	14			Clam Shrimp	5 CTS					
18	GC, JG	4/27/10	1600	21.5	24	9	12	0.5									
21	GC, JG	4/27/10	1605	21	24	15	3	1									
24	GC, JG	4/27/10	1636	21	24	11	4	1.5									
26	GC, JG	4/27/10	1638	21	24	10	15	1.5									
42	GC, JG	4/27/10	1501	23	24	6	2	1									
60	GC, JG	4/27/10	1608	18	24	75+	26	23									
65	GC, JG	4/27/10	1620	17	24	75+	72	30									
71	GC, JG	4/27/10	1640	21	24	16	55	2									
72	GC, JG	4/27/10	1645	21	24	12	25.5	3									
29	GC, JG	4/28/10	1036	13.5	11	11	6.5	3.5									
30	GC, JG	4/28/10	1019	12	11	15	2	2									
32	GC, JG	4/28/10	1003	12	11	55	24	7									
34	GC, JG	4/28/10	1017	12	11	21	8	5.5									
35	GC, JG	4/28/10	1045	13.5	11	11	5.5	5									
88	GC, JG	4/28/10	957	12.5	11	14	3	2.5									
90	GC, JG	4/28/10	1011	12.5	11	11	10	4									
16	AP	5/11/10	815	8	9	23	14	7				17 cts larva, 3"-4"					
33	AP	5/11/10	936	10	12	30	20	4									
60	AP	5/11/10	833	10	9	40+	25	14									
65	AP	5/11/10	850	11	9	50+	63	27									
108	AP	5/11/10	758	9.5	9	7	18	3									
112	AP	5/11/10	745	8	9	9	7	4									
60	AP	5/25/10	825	13	14	40+	20	14									
65	AP	5/25/10	850	13	14	50+	54	22									
60	AP	6/7/10	810	19.5	23	35	19	10									
65	AP	6/7/10	832	20	23	50	51	20									

***** JG=Jeff Gurule; GC=Geoff Cline; AP=Austin Pearson
CGH=Cattle Grazing Heavy

APPENDIX C:
POOL COORDINATES

Panoche Solar Farm Pool Locations **Grid: UTM** **Datum: NAD83** **Zone: 10S**

Pool #	Easting	Northing	Altitude
1	689496	4055757	1305 ft
2	688302	4055313	1342 ft
3	689829	4056101	1324 ft
4	689834	4056100	1319 ft
5	689763	4056093	1314 ft
6	689688	4056103	1316 ft
7	689326	4056083	1320 ft
8	688589	4056816	1372 ft
9	688595	4056815	1374 ft
10	689470	4057479	1342 ft
11	689036	4057670	1333 ft
12	688911	4057611	1335 ft
13	688921	4057611	1338 ft
14	687939	4057814	1379 ft
15	687945	4057818	1382 ft
16	688234	4058362	1380 ft
17	688572	4058300	1402 ft
18	689004	4058842	1332 ft
19	689014	4059176	1357 ft
20	688840	4058916	1356 ft
21	689086	4059160	1354 ft
22	689119	4058641	1330 ft
23	689120	4058634	1320 ft
24	689187	4058476	1331 ft
25	689181	4058467	1316 ft
26	689204	4058399	1318 ft
27	689270	4058041	1318 ft
28	689811	4057710	1306 ft
29	689938	4056148	1308 ft
30	690230	4056326	1294 ft
31	691090	4057257	1358 ft
32	690834	4055790	1271 ft
33	690806	4055805	1279 ft
34	690648	4056380	1286 ft
35	690460	4054895	1314 ft
36	689732	4056112	1308 ft
37	689708	4056105	1337 ft
38	689626	4056092	1327 ft
39	686835	4056546	1454 ft
40	689145	4057604	1309 ft
41	689113	4057614	1327 ft
42	689033	4057647	1329 ft
43	688292	4057609	1362 ft
44	689083	4058673	1320 ft

Pool #	Easting	Northing	Altitude
45	689115	4058610	1320 ft
46	689842	4056105	1301 ft
47	689839	4057712	1311 ft
48	690492	4058250	1374 ft
49	689828	4055797	1296 ft
50	689855	4055796	1294 ft
51	689333	4056074	1312 ft
52	686969	4056483	1469 ft
53	686814	4056424	1484 ft
54	686776	4056341	1486 ft
55	686907	4056277	1476 ft
56	688248	4057597	1378 ft
57	688437	4057625	1361 ft
58	688657	4057633	1351 ft
59	689019	4058710	1344 ft
60	689075	4059037	1331 ft
61	689072	4059015	1337 ft
62	689086	4058729	1325 ft
63	689107	4058687	1338 ft
64	689125	4058590	1320 ft
65	689181	4058543	1312 ft
66	689199	4058519	1310 ft
67	689190	4058645	1305 ft
68	689208	4058395	1332 ft
69	689269	4058326	1309 ft
70	689236	4058317	1301 ft
71	689323	4058278	1305 ft
72	689366	4058222	1305 ft
73	689288	4058054	1312 ft
74	689248	4057557	1329 ft
75	689355	4057533	1338 ft
76	689431	4057496	1320 ft
77	689443	4057485	1316 ft
78	696325	4053843	1330 ft
79	691459	4055163	1264 ft
80	691320	4055354	1257 ft
81	691291	4055371	1245 ft
82	691217	4055474	1270 ft
83	691196	4055487	1260 ft
84	691183	4055498	1279 ft
85	691004	4055643	1256 ft
86	690938	4055687	1267 ft
87	690890	4055745	1274 ft
88	690875	4055737	1275 ft

Pool #	Easting	Northing	Altitude
89	690848	4055758	1285 ft
90	690724	4056063	1285 ft
91	690585	4056501	1294 ft
92	689917	4057463	1316 ft
93	691576	4056566	1361 ft
94	691108	4057252	1362 ft
95	689847	4056821	1301 ft
96	690484	4054899	1289 ft
97	691460	4055152	1241 ft
98	691441	4055189	1236 ft
99	691385	4055274	1236 ft
100	686848	4056217	1490 ft
101	689315	4057548	1331 ft
102	689029	4058943	1312 ft
103	689781	4055798	1307 ft
104	687276	4056536	1469 ft
105	689824	4057202	1308 ft
106	689163	4057595	1323 ft
107	691959	4054950	1247 ft
108	691936	4054959	1252 ft
109	691827	4054980	1234 ft
110	691813	4054979	1246 ft
111	691629	4055068	1256 ft
112	691593	4055078	1253 ft
113	691552	4055092	1249 ft
114	691461	4055137	1258 ft
115	691417	4055233	1251 ft
116	691346	4055332	1252 ft
117	691281	4055396	1256 ft
118	691206	4055485	1269 ft
119	691049	4055621	1263 ft
120	690950	4055672	1264 ft
121	690796	4055862	1268 ft
122	690685	4056192	1292 ft
123	690458	4054510	1277 ft
124	689225	4058981	1329 ft
125	689226	4059076	1346 ft
126	689230	4059090	1336 ft
127	689092	4058711	1338 ft
128	692072	4054918	1258 ft

APPENDIX D:
PHOTOS

Photo 1: Looking SW at Pool #12 - a stock pond. Vernal pool fairy shrimp (*Branchinecta lynchi*) were observed in this pool on 3/16/10.

Photo 2: Looking SE at Pool #5, a natural vernal pool at the toe of a swale. No shrimp were observed in this pool during the 09/10 wet season survey.

Photo 3: LOA Biologist Mr. Jeff Gurule (TE-168924) sampling Pool #50 at the intersection of a ranch road and Little Paonoche Road looking east. This pool is an example of the many ruderal pools associated with the ranch roads on the site. No shrimp were observed in this pool during the 09/10 wet season survey.

Photo 4: Incidental California tiger salamander observation from Pool #16 on May 11th, 2010.

Photo 5: Looking south across the study area.

Photo 6: Looking north across the study area.

LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

August 13, 2010

Douglass Cooper
Fish and Wildlife Service
2493 Portola Road, Suite B
Ventura, California 93003

RE: Non-Protocol Branchiopod Survey Results, Solargen Energy, Panoche Valley Mitigation Parcels.

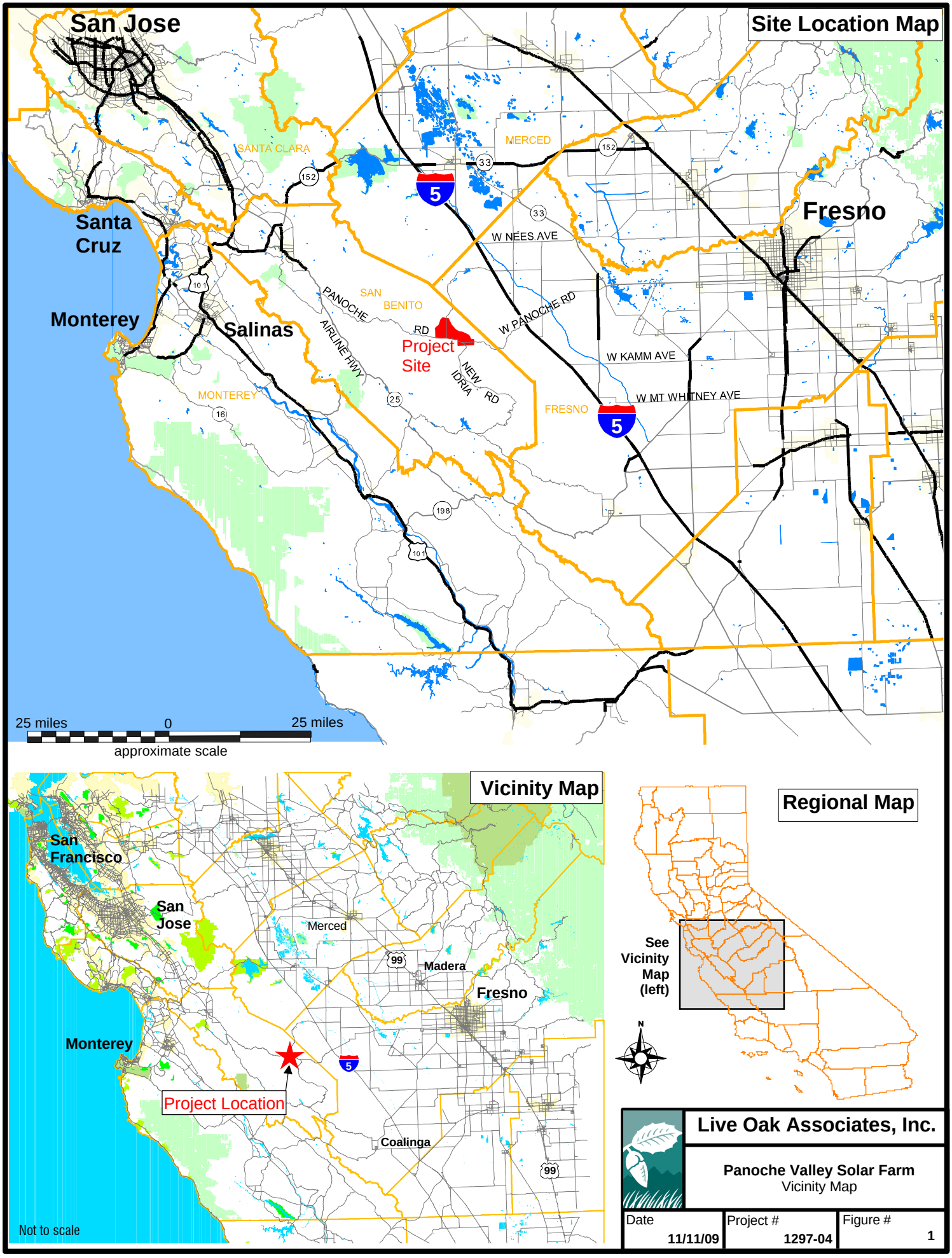
Douglass:

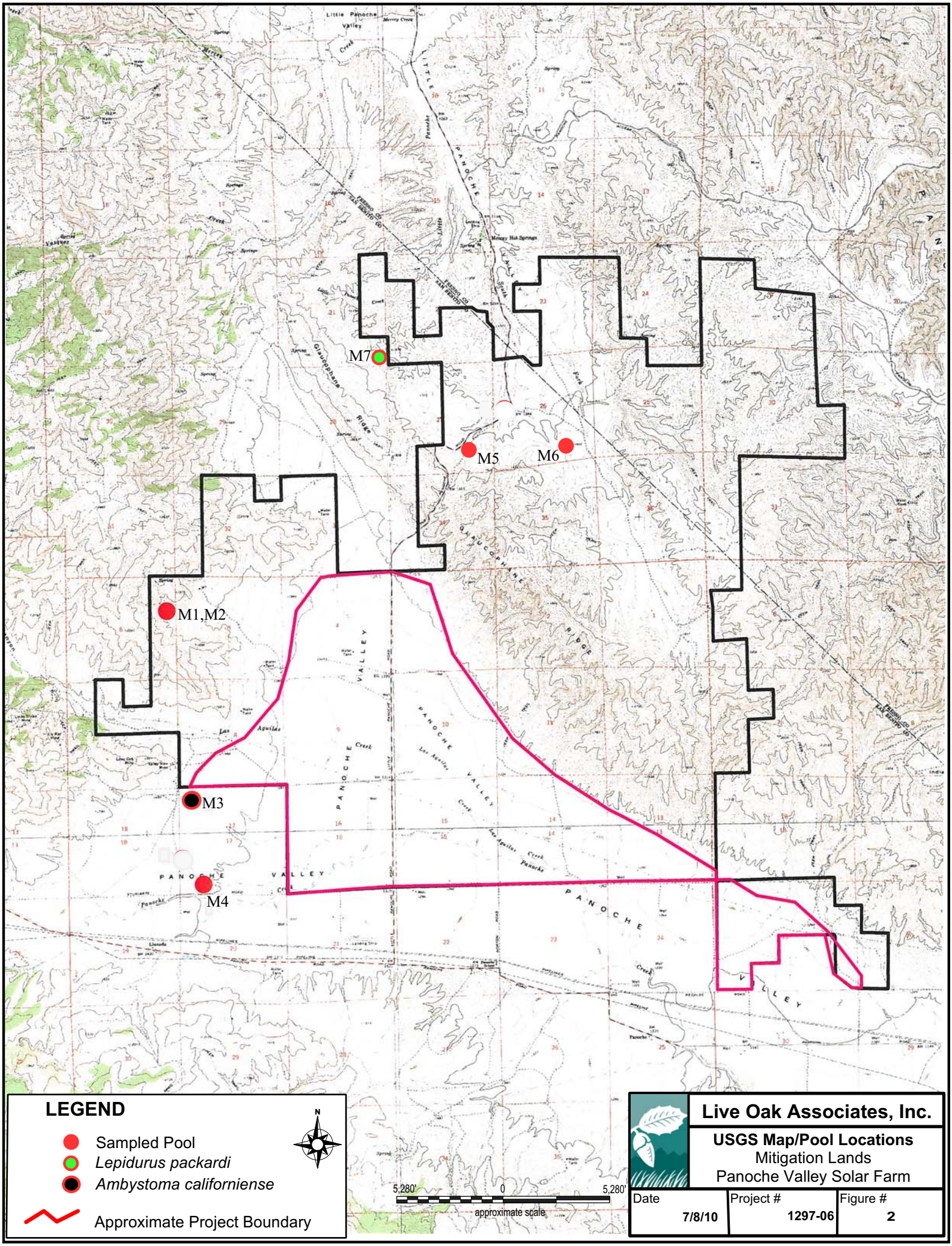
This letter serves the purpose of the 90-day survey report, as required by the U.S. Fish and Wildlife Service (USFWS), for the results of a non-protocol reconnaissance Brachiopod survey conducted on approximately 10,300 acres of property for the Solargen Energy solar project in Panoche Valley, CA. The survey site is located in east-central San Benito County and southwest Fresno County, approximately 8 miles west of Interstate 5, less than 1 mile south of Mercey Hot Springs, east of Pinnacles National Monument, and north of Panoche Road, along Little Panoche Road (Figure 1). The site can be found on the Cerro Colorado, Mercey Hot Springs, Llanada, and Panoche, California U.S.G.S quadrangles, in Sections 19, 30, and 31 of Township 14 south, Range 11 east; Section 21-27 and 32-36 of Township 14 south, Range 10 east; Sections 1-8 and 11-14 of Township 15 south, Range 10 east; Sections 6, 7, 19, and 20 of Township 15 south, Range 11 east (Figure 2).

On April 14th, 2010, Live Oak Associates, Inc. (LOA) biologist Mr. Jeff Gurule (TE-168924-0), assisted by Mr. Geoff Cline (an un-permitted LOA biologist), surveyed the site for federally listed vernal pool crustaceans. The proposed survey was deemed acceptable via a phone conversation between Michele Korpos, LOA Panoche Project Manager, and Chris Diel of the Ventura USFWS office on April 9, 2010 with the understanding that maps delineating the survey area would be sent by Ms. Korpos and a written authorization would be issued by the USFWS after review of the proposed survey area. However, apparently the maps were never received by Mr. Diel and no written authorization was issued. In discussing this issue with Mr. Diel on August 2, 2010, the consensus was that since the surveys were non-protocol surveys conducted on a single day late in the season, the lack of a formal authorization was not concerning.

Methods

Mr. Gurule and Mr. Cline selected pools to sample as directed by LOA biologist Michele Korpos, who mapped pools potentially suitable for vernal pool crustaceans during the course of other biological surveys of the study area. The sampling method was consistent with USFWS


Site Location Map
San Jose
Santa Cruz
Monterey
Salinas
Fresno
SANTA CLARA
MERCED
MONTEREY
FRESNO
SAN BENITO
PANOCHE RD
W PANOCHE RD
W NEES AVE
W KAMM AVE
W MT WHITNEY AVE
AIRLINE HWY
NEW IDRIA RD
Project Site
5
152
33
101
25
16
198
25 miles
0
25 miles
approximate scale
Vicinity Map
San Francisco
San Jose
Merced
Madera
Fresno
Monterey
Coalinga
99
Project Location
Not to scale
Regional Map
See Vicinity Map (left)
N
Live Oak Associates, Inc.
Panoche Valley Solar Farm
Vicinity Map
Date
11/11/09
Project #
1297-04
Figure #
1


M7
M5
M6
M1,M2
M3
M4
PANOCHE VALLEY
LITTLE PANOCHE VALLEY
GLAUCOPHANE RIDGE
Little Panoche Valley
Panoche Creek
Los Aguilas
Los Aguilas Creek
Glaucophane Ridge
Panoche Hot Springs
Vasquez
Llanada
LEGEND
Sampled Pool
Lepidurus packardi
Ambystoma californiense
Approximate Project Boundary
N
5,280'
0
5,280'
approximate scale
Live Oak Associates, Inc.
USGS Map/Pool Locations
Mitigation Lands
Panoche Valley Solar Farm
Date
7/8/10
Project #
1297-06
Figure #
2

Recovery Permit requirements. Each pool was thoroughly sampled with a dip net. Pool characteristics and aquatic species observed were recorded on a previously approved data sheet, authorized via email by David Kelly with the USFWS on November 12, 2008 (See Attachment A). The data sheet is formatted to an Excel spreadsheet, with data entered in the field directly into the spreadsheet via a PDA. Pool location coordinates were collected using a Garmin Rino 120 handheld GPS unit.

Results

Mr. Gurule and Mr. Cline sampled seven pools. Pool locations are presented in Figure 2, survey results are presented in Attachment B, and Lat. Long. coordinates of each sampled pool are presented in Attachment C. Branchiopods were found in one of the seven pools surveyed (Pool M7). Individuals were netted, observed, identified as vernal pool tadpole shrimp (*Lepidurus packardi*), photographed, and released. Additionally, California tiger salamander larvae (*Ambystoma californiense*) were netted in Pool M3. Photos are presented in Attachment D.

Discussion

The discovery of the Federally Endangered *L. packardi* is significant. This represents a fairly substantial range extension of the species. Prior to this discovery, no populations of *L. packardi* were known in San Benito County or western Fresno County (CNDDB 2010 and Draft Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon 2004).

Although the April 14th, 2010 survey found *L. packardi* in one pool (Pool M7), this single day of surveying does not provide sufficient evidence of the absence of other branchiopods, including listed branchiopods such as the *Branchiata lynchi*, from the site. There remains the possibility that had protocol level surveys been conducted, federally listed anostracans such as *B. lynchi* may have been found in some pools of the site.

Please feel free to contact me with any further questions or comments.

Sincerely,

Jeff Gurule
Senior Project Manager
Staff Ecologist

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Jeff Gurule, Permit # TE-168924-0

Signature:_____. Date: August 13, 2010.

ATTACHMENT A:
DATA SHEET AUTHORIZATION

Jeff Gurule

From: David_Kelly@fws.gov
Sent: Wednesday, November 12, 2008 7:59 AM
To: Jeff Gurule
Cc: Elizabeth_Warne@fws.gov; Josh_Hull@fws.gov
Subject: Re: Branchiopod Survey Data Sheet
Attachments: Data Sheet Template.xls

Jeff, the data sheet that you presented contains the information that we required in the protocol for the VPb surveys. You are authorized to use this survey form until otherwise notified. Thank you.

David Lee Kelly
Fish and Wildlife Biologist
Recovery Branch
US Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825
Ph. (916) 414-6492

Jeff Gurule <jgurule@loainc.com>

11/11/2008 04:38 PM

To <David_Kelly@fws.gov>
cc
Subject Branchiopod Survey Data Sheet

Hi David,

Last rainy season Live Oak Associates, Inc. conducted branchiopod surveys on three properties in Fresno County with numerous vernal pools on each (the largest containing 92 pools); this resulted in numerous data sheets (over a 1,000 pages of data sheets) submitted with our 90-day reports. Not only were these data sheets difficult to organize and proof, PDF's of the final reports were so huge it was difficult to email them with the data sheets attached. I believe that you expressed interest, yourself, in having us utilize an abbreviated data sheet for ease of handling and reviewing after seeing how many data sheets we had amassed in those surveys.

So, as Live Oak has authorization to conduct 2nd year surveys on properties we surveyed last year, plus additional properties not surveyed last year, I have created an EXCEL template to serve as our data sheet for all surveys conducted this year. I am submitting this template for your approval. I believe using this data sheet will greatly increase efficiency, present the data in a more useful format, and greatly reduce the potential for error.

I have included an explanation of codes that would be used in the Surveyors and Habitat Condition/Land Use columns. This explanation of codes would ultimately be located at the bottom of the EXCEL sheet.

I hope this is acceptable to you or that you have some suggestions on how to further simplify it. I hope to here back from you soon, as weather conditions may necessitate initiation of surveys soon.

Thanks,

Jeff Gurule
Project Manager
Wildlife/Wetland/Plant Ecologist

ATTACHMENT B:
DATA SHEET

U.S. Fish and Wildlife Service Vernal Pool Data Sheet Wet Season Non-Protocol Survey 2010 **Panoche Valley Mitigation Land (1297-06), San Benito County, Cerro Colorado, Mercey Hot Springs, Llanada, & Panoche Quads, Township: 15S, Range: 10E & 11E**													**Fairy Shrimp ID Sheet 2010** **Panoche Valley Mitigation Land (1297-06)**				
Pool #	Surveyers*	Date	Time (24hr)	Water Temp	Air Temp	Depth (cm)	Length (m)	Width (m)	Habitat Conditions/ Land Use*	Number of Shrimp in Pool	Number, Sex, Genus Collected	Notes	Number, Sex, Species IDed	Listed Species (x)	Date Identified	Identified By	Comments
M1	JG,GC	4/14/10	1147	14	15	29	5	5	CGM			mitigation pond					
M2	JG,GC	4/14/10	1150	12.5	15	53	9	5	CGM			mitigation pond					
M3	JG,GC	4/14/10	1223	13	15	75+	69	34	CGM			mitigation pond, clam shrimp,5 CTS					
M4	JG,GC	4/14/10	1251	11	15	75+	57	24	CGM			mitigation pond, clam shrimp					
M5	JG,GC	4/14/10	1717	19	15	25	12.5	10	CGM			mitigation pool					
M6	JG,GC	4/14/10	1735	19	15	10	11	5.5	CGM			mitigation pool					
M7	JG,GC	4/14/10	1818	19	15	13	60	29	CGM	100s	100s of *Lepidurus packardi*	mitigation pool, 100's tadpole shrimp	No tadpole shrimp collected. See Appendix C for photos	x	4/14/2010	JG	

***** JG=Jeff Gurule; GC=Geoff Cline
CGM=Cattle Grazing Moderate

ATTACHMENT C:
POOL UTM COORDINATES

Panoche Solar Farm Pool Locations Grid: UTM Datum: NAD83 Zone: 10S

Pool #	Easting	Northing	Altitude
M1	686801	4058372	1663 ft
M2	686757	4058366	1656 ft
M3	686887	4055826	1433 ft
M4	687076	4054586	1376 ft
M5	690899	4061045	1443 ft
M6	692421	4061098	1419 ft
M7	689604	4062415	1438 ft

ATTACHMENT D:
PHOTOS

View Looking North of Pool 135 (Tadpole Shrimp Pool)

Tadpole Shrimp

View Looking West Over Survey Area, No Pools in Vicinity.

View Looking East Over Survey Area, No Pools in Vicinity.

View Looking South Over Survey Area, Pool M4 in background out of site.

LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

June 17, 2010

Eric Cherniss
Vice President of Project Development
Solargen Energy, Inc.
20400 Stevens Creek Blvd., Suite 700
Cupertino, CA 95014

Subject: Early spring rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California (PN 1297-04b)

Dear Eric:

Live Oak Associates, Inc. (LOA), has completed a focused early spring survey for special status plants (i.e., plants designated as endangered, threatened, or rare (CDFG 2010) and plants listed by the California Native Plant Society (2009)) on 4,717 acres of the Panoche Valley Solar Farm site (hereafter referred to as "study area") located along Little Panoche Road in San Benito County, California. Specifically, this survey was conducted to determine whether or not special status plants that would bloom in March or April were present within the study area in 2010.

Site Location and Existing Conditions

The project site occurs on the floor of Panoche Valley between the Gabilan Range to the west and the Panoche Hills to the east. The survey area is generally bounded to the west, north, and east by open space and rangelands and to the south by Yturiarte Road (Figure 1). Surrounding lands consist of rangelands used for cattle grazing.

The early spring 2010 study area included valley floor topography (i.e., areas generally of less than 5% slope) within all or portions of Sections 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, and 16, of Township 15 south, Range 10 east, and Section 19 of Township 15 south, Range 11 east (Figure 2). Habitats present within this area include relatively flat rangelands and gentle slopes dominated by moderately saline clay soils, the beds and banks of seasonally flowing arroyo-like creeks (Panoche Creek, for example, which flowed throughout most of the survey period), and many ephemeral drainages and low swales that were repeatedly charged by runoff events. Various disturbance intensities associated with cattle grazing provide further microhabitat variation for plants. Rainfall amounts in 2010 were estimated by local measurement to be nearly 200% of the long-term average, providing an excellent environment for plant growth and

flowering, and thus allowing the opportunity to compile a reasonably complete inventory of the study area's plant assemblage.

Literature Search and Botanical Survey

A literature search was conducted in order to identify special status plant species that may potentially occur within the study area's available habitats. A search of the California Natural Diversity Database and review of environmental documentation for area projects uncovered 22 potentially occurring special status plants. Consultation with local California Department of Fish and Game botanists, Mr. Dave Hacker and Ms. Ellen Cypher, and with a local Bureau of Land Management botanist, Mr. Ryan O'Dell, yielded one additional potentially occurring special status species (*Caulanthus californicus*) that was included in the search list (Table 1). Of these 23 species, 19 have flowering periods (i.e., optimal survey times) that fall within the March-April period chosen for the early spring botanical survey. This includes San Joaquin woollythreads (*Monolopia congdonii*) and California jewelflower (*Caulanthus californicus*), species that are federally listed as endangered. Based upon the expected phenologies suggested within the published literature, it was decided that the presence or absence of eight potentially occurring special status species (*Astragalus macrodon, Atriplex vallicola, Blepharizonia plumosa, Cordylanthus mollis* ssp. *hispidus, Deinandra halliana, Eriogonum vestitum, Navarretia nigelliformis* ssp. *radians,* and *Trichostema ovatum*) would be determined by additional surveys conducted during their blooming period in May-July 2010. None of the search species listed in Table 1 were detected within the study area during an August-October 2009 botanical survey (LOA, 2009).

Table 1. Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2010).

Species	Status*	Habitat	Blooming Period
Santa Clara thorn-mint *Acanthomintha lanceolata* Annual herb	CNPS 4	Chaparral, woodland, rocky, often serpentine	March-June
Forked fiddleneck *Amsinckia vernicosa* var. *furcata* Annual herb	CNPS 4	Woodland, grassland	February-May
California androsace *Androsace elongata* ssp. *acuta* Annual herb	CNPS 4	Chaparral, woodland, meadows and seeps, grassland	March-June
Salinas milk-vetch *Astragalus macrodon* Perennial herb	CNPS 4	Chaparral, woodland, grassland	April-July
Crownscale *Atriplex coronata* var. *coronata* Annual herb	CNPS 4	Chenopod scrub, grasslands, and vernal pools, alkaline soils	March–October

Table 2 (cont'd). Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2010).

Species	Status*	Habitat	Blooming Period
Lost Hills crownscale *Atriplex vallicola* Annual herb	CNPS 1B	Chenopod scrub, grasslands, and vernal pools, alkaline soils.	April–August
Big tarplant *Blepharizonia plumosa* Annual herb	CNPS 1B	Dry areas in grasslands	July–October
Round-leaved filaree *California macrophylla* Annual herb	CNPS 1B	Woodland, grassland	March-May
California jewelflower *Caulanthus californicus* Perennial herb	FE, CNPS 1B	grasslands (non-alkaline), flats	March-May
Lemmon's jewelflower *Caulanthus coulteri* var. *lemmonii* Perennial herb	CNPS 1B	Pinyon-juniper woodland, grassland	March-May
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus* Annual herb	CNPS 1B	Meadows and seeps, playas, grasslands, often damp, alkaline	June–September
Hall's tarplant *Deinandra halliana* Annual herb	CNPS 1B	Chenopod scrub, grassland, clay soils	April-May
Gypsum-loving larkspur *Delphinium gypsophilum* ssp. *gypsophilum* Perennial herb	CNPS 4	Chenopod scrub, grassland, clay soils	February-May
Recurved larkspur *Delphinium recurvatum* Perennial herb	CNPS 1B	Chenopod scrub, grassland, alkaline	March-June
Idria buckwheat *Eriogonum vestitum* Annual herb	CNPS 4	Grasslands, open slopes	April–August
Pale yellow layia *Layia heterotricha* Annual herb	CNPS 1B	Pinyon-juniper woodland, alkaline grassland, clay	March-June

Table 3 (cont'd). Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2010).

Species	Status*	Habitat	Blooming Period
Panoche peppergrass *Lepidium jaredii* ssp. *album* Annual herb	CNPS 1B	Grassland, washes and alluvial fans	February-June
Serpentine leptosiphon *Leptosiphon ambiguus* Annual herb	CNPS 4	Grassland, often on serpentine soil	March-June
Showy golden madia *Madia radiata* Annual herb	CNPS 1B	Woodland, grassland	March-May
San Joaquin woollythreads *Monolopia congdonii* Annual herb	FE, CNPS 1B	Chenopod scrub, grassland, sandy	February-May
Shining navarretia *Navarretia nigelliformis* ssp. *radians* Annual herb	CNPS 1B	Woodland, grassland, vernal pools	May-July
Chaparral ragwort *Senecio aphanactis* Annual herb	CNPS 2	Woodland, chaparral	January-April
San Joaquin bluecurls *Trichostema ovatum* Annual herb	CNPS 4	Chenopod scrub, grasslands	July–October

***Status Codes**

California Native Plant Society (CNPS) list designations

1B: Plants Rare, Threatened, or Endangered in California and elsewhere

2: Plants Rare, Threatened, or Endangered in California but more common elsewhere

4: Plants of limited distribution – a watch list

Survey Methods

Known nearby populations of potentially occurring special status plant species were visited in order to develop a search image for these special status species and to verify that the timing of on-site survey work would coincide with the period in which these species can be readily seen and are separable from common local species. Reference populations chosen for observation were all located at elevations similar to the study area and within 10 miles of the study area. Reference populations visited in March included forked fiddleneck, recurved larkspur, showy golden madia, San Joaquin woollythreads, and chaparral ragwort. Reference populations visited in April included San Joaquin woollythreads, Santa Clara thorn-mint, Lemmon's jewelflower, and gypsum-loving larkspur. These visits consistently supported the chosen period for the survey as being within the anthesis period of potentially occurring special status species.

Focused special status plant species surveys were conducted by LOA botanists Neal Kramer and Jim Paulus, and LOA ecologists Davinna Ohlson, Nathan Hale, Jessica Celis, Geoff Cline, Molly Goble, and Pamela Peterson, using the same methodology as described for the fall 2009 survey (LOA 2009). In summary, the survey team walked the entire site in evenly-spaced transects, ensuring 100% visual coverage, during the species' blooming period when they would be evident and most identifiable. Emphasis was placed on areas more likely to support suitable habitat for the target species. All vascular plant species observed were recorded in a field notebook. The survey was floristic, striving to identify all species to the level of taxa needed to separate occurring species from the potentially occurring special status species identified during the literature review (Appendices A and B). The survey methodology is consistent with survey protocols outlined by the CNPS and complied with the most recent California Department of Fish and Game guidelines (Appendix C). Surveys were conducted from March 8 through April 9, 2010.

Results: Plant Species Present in March-April 2010

Results of the March-April 2010 botanical survey, which was conducted at the height of the annual growing season, indicate much greater diversity is present than was suggested by the fall 2009 survey alone. The 2010 survey added 137 species to the study area total (202 species as of April 9, see Appendix A). Annuals comprise nearly 100% of the standing vegetation, with the few occurring shrubs confined to the beds and banks of Panoche Creek and Los Aguilas Creek. Non-native species are clearly dominant throughout the study area. Native plant dominance was found only at the patch (below subcommunity) grain.

No federal or state listed plant species were found within the study area. No species that could be confused with either San Joaquin woollythreads or California caulanthus, the two federally-endngered species having the potential to occur on the site, were present in 2010. The survey detected seven populations classifiable as the CNPS List 1B species recurved larkspur (*Delphinium recurvatum*), one populations of the CNPS List 4 gypsum-loving larkspur, and three populations of the CNPS List 4 serpentine leptosiphon (Figure 2). Special status plant identifications in the field, and the mapping of populations, were performed by one of the two LOA botanists who participated in all surveys.

Plants classifiable as recurved larkspur were widely scattered in very small groups, with three of the seven mapped occurrences consisting of a single individual and no occurrence of greater than 20 individuals. A technical memorandum prepared by Dr. Paulus discusses non-characteristic traits common to these plants, including weak sepal coloration, and variations that suggest these plants may be hybrids of *D. recurvatum* with the locally occurring, less sensitive gypsum-loving larkspur (*D. gypsophilum* ssp. *gypsophilum*) and foothill larkspur (*D. hesperium* ssp. *pallescens*) (Appendix D).

Gypsum-loving larkspur was found at one scattered occurrence in Section 19. Unlike the plants in Sections 4 and 8, where the plants could not be separated from recurved larkspur, these plants fit well within the expected species characteristics of gypsum-loving larkspur. Individuals appear to be confined rather narrowly to north or northwest-facing slopes associated with gully habitats that are available only at the fringe of the study area. Larkspurs, which are perennial

within the study area, would be difficult to relocate due to their large, deep-seated root systems and possibly narrow habitat requirements.

Serpentine leptosiphon occurred in 2010 in impressive displays totaling several tens of thousands of plants within the study area. Comparatively little is known about the regional distribution of this species. It may reside chiefly in the seedbank for long periods, waiting for a relatively wet climate such as experienced in the spring of 2010. Because it is an annual species, it is possible that avoidance of serpentine leptosiphon during project implementation could be achieved by stockpiling of the topsoil for seedbank relocation to a reserve area.

If ground disturbance activities begin more than three to five years past the date of this survey, then the site should be resurveyed to evaluate any changes in habitat conditions and determine the presence or absence of the target species on the site.

If you have any questions regarding our findings, please contact Rick Hopkins at rhopkins@loainc.com or (408) 281-5885 at your earliest convenience.

Sincerely,

Davinna Ohlson, M.S.
Senior Project Manager
Plant/Wildlife Ecologist

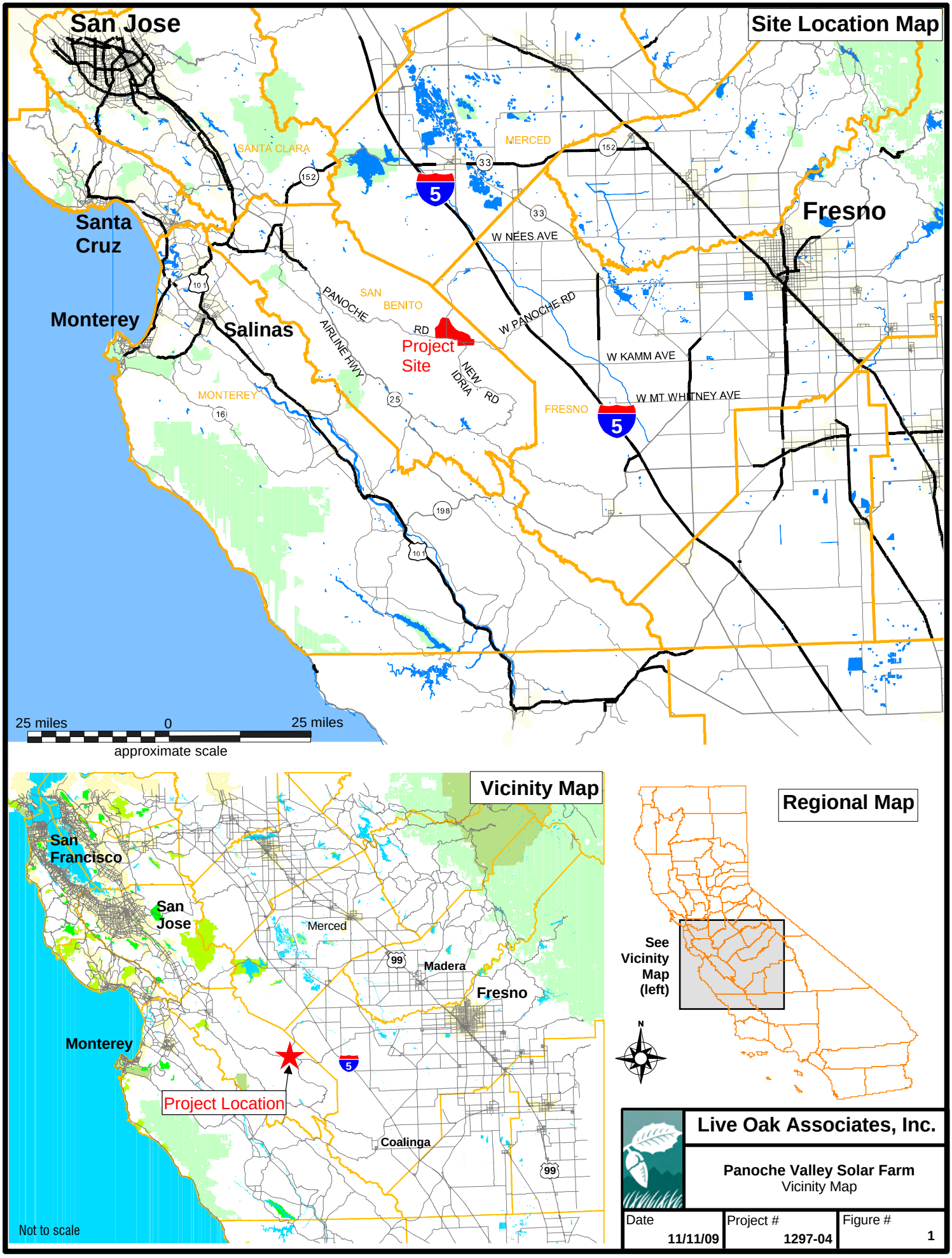
Enclosures

References

California Department of Fish and Game, Natural Diversity Database, 2010. Special Vascular Plants, Bryophytes and Lichens List (revised January 2010). The Resources Agency, State of California, Sacramento.

California Native Plant Society. 2009. Inventory of Rare and Endangered Vascular Plants of California (7th Edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA.

Live Oak Associates, 2009. Late summer/early fall rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California. Letter from D. Ohlson to E. Cherniss, dated November 24, 2009.



Live Oak Associates, Inc.		
Panoche Valley Solar Farm Vicinity Map		
Date 11/11/09	Project # 1297-04	Figure # 1

LEGEND

Area Surveyed for Rare Plants

12 US Public Land Survey Sections

2010 Early Spring Survey

Delphinium gypsophilum

Delphinium recurvatum

Leptosiphon ambiguus

Aerial Photograph courtesy of Digital Globe

N

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

1 mile 0 1 mile

approximate scale

Live Oak Associates, Inc.

Panoche Valley Solar Farm

Spring 2010 Rare Plant Survey

Date	Project #	Figure #
5/26/2010	1297-04b	2

APPENDIX A: VASCULAR PLANTS OF THE STUDY AREA

The plants species listed below were observed on the Panoche Valley solar farm site during the field survey conducted by Live Oak Associates in March and April 2010. The U.S. Fish and Wildlife Service wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland
+/- - Higher/lower end of category
NI - No investigation

Scientific Name	Common Name	Wetland Status
ALLIACEAE - Allium Family		
Allium crispum	crinkled onion	UPL
Allium howellii var. *howellii*	Howell's onion	UPL
APIACEAE - Carrot Family		
Lomatium dissectum var. *multifidum*	carrot leaved biscut root	UPL
Lomatium utriculatum	common lomatium	UPL
Sanicula bipinnatifida	purple sanicle, snakeroot	UPL
Sanicula crassicaulis	Pacific sanicle, gamble weed	UPL
Tauschia hartwegii	Harweg's umbrellawort/tauschia	UPL
ASTERACEAE - Sunflower Family		
Achyrachaena mollis	blow wives	UPL
Ambrosia acanthicarpa	annual bursage	UPL
Artemisia californica	California sagebrush	UPL
*Centaurea melitensis**	tocalote	UPL
Centaurea sp.*	knapweed/thistle	UPL
Ericameria sp.	goldenbush	UPL
Ericameria cuneata	cliff/rock/wedgeleaf goldenbush	UPL
Ericameria linearifolia	interior/narrow-leaf goldenbush	UPL
Hemizonia sp.	Kellogg's tarweed	UPL
Heterotheca oregona var. rudis	inland Oregon golden aster	UPL
*Hypochaeris glabra**	smooth cat's ear	UPL
Isocoma menziesii var. vernonioides	coastal isocoma, coast goldenbush	FACW
Lasthenia californica	coast/California/common goldfields	UPL
Layia platyglossa	common tidy-tips	UPL
Layia sp.	tidy-tips	FAC/FACW
Logfia filaginoides	logfia	UPL
Malacothrix coulteri	snakes head	UPL
*Matricaria matricarioides**	pineapple weed	FACU
Microseris sp.	microseris	UPL
Microseris douglasii ssp. *douglasii*	Douglas' silverpuffs	UPL
Microseris cf. *sylvatica*	sylvan scorzonella	UPL
Monolopia major	cupped monolopia	UPL

Monolopia stricta	Crum's monolopia	UPL
Psilocarphus brevissimus var. brevissimus	dwarf woolly-heads	OBL
Senecio flaccidus var. douglasii	Douglas' groundsel/shrubby butterweed	UPL
*Senecio vulgaris**	common groundsel	NI*
*Sonchus oleraceus**	common sow thistle	NI*
Stephanomeria sp.		UPL
Tragopogon sp.	salsify, goatsbeard	UPL
Uropappus lindleyi	silverpuffs	UPL
BORAGINACEAE - Borage Family		
Amsinckia menziesii var. intermedia	common fiddleneck	UPL
Amsinckia menziesii var. menziesii	Menzies' /small-flowered fiddleneck	UPL
Amsinckia tessellata	devil's lettuce, checker fiddleneck	UPL
Cryptantha decipiens	gravelbar cryptantha	UPL
Cryptantha flaccida	flaccid cryptantha	UPL
Heliotropium curassavicum	seaside/salt heliotrope	OBL
Pectocarya linearis ssp. ferocula	slender winged combseed	UPL
Pectocarya penicillata	winged combseed	UPL
Phacelia ciliata	Great Valley phacelia	UPL
Plagiobothrys acanthocarpus	adobe popcornflower	OBL
Plagiobothrys canescens	valley popcornflower	UPL
Plagiobothrys humistratus	dwarf popcornflower	OBL
Plagiobothrys nothofulvus	rusty popcornflower	FAC
Plagiobothrys stipitatus var. micranthus	stocked popcornflower	OBL
BRASSICACEAE - Mustard Family		
Athysanus pusillus	common sandweed, dwarf athysanus	UPL
*Brassica nigra**	black mustard	UPL
*Brassica tournefortii**	Asian mustard	UPL
*Capsella bursa-pastoris**	shepherd's purse	FAC-
*Descurainia sp.**	tansymustard	UPL
*Descurainia sophia**	flixweed, tansymustard	UPL
*Eruca vesicaria**	garden rocket	UPL
Guillenia lasiophylla	California mustard	UPL
*Hirschfeldia incana**	summer mustard	UPL
Lepidium dictyotum var. acutidens	alkali peppergrass	OBL
Lepidium dictyotum var. dictyotum	alkali peppergrass	OBL
Lepidium nitidum var. nitidum	shining peppergrass	UPL
Raphanus raphanistrum	painted charlock/wild raddish	UPL
*Sinapis arvensis**	charlock	UPL
*Sisymbrium irio**	London rocket	UPL
*Sisymbrium orientale**	oriental mustard	UPL
Thysanocarpus curvipes	lacepod/fringe pod, ribbed fringepod	UPL
Tropidocarpum gracile	slender keel fruit, dobie pod	UPL
CARYOPHYLLACEAE - Pink Family		
*Herniaria hirsuta var. cinerea**	herniaria	UPL
*Spergularia rubra**	red sandspurry	FAC-
Stellaria media	common chickweed	FACU
Stellaria nitens	shiny chickweed	UPL
CHENOPODIACEAE - Goosefoot Family		
*Atriplex cf. semibaccata**	Australian saltbush	FAC
Atriplex polycarpa	cattle/allscale/desert saltbush	UPL

*Salsola tragus**	Russian thistle, tumbleweed	FACU
CONVOLVULACEAE - Morning-Glory or Bindweed Family		
*Convolvulus arvensis**	bindweed, orchard morningglory	UPL
CRASSULACEAE - Stonecrop Family		
Crassula connata	pigmy weed	UPL
EUPHORBIACEAE - Spurge Family		
Eremocarpus setigerus	turkey mullein, dove weed	UPL
FABACEAE - Legume Family		
Astragalus gambelianus	Gambell's dwarf milkvetch	UPL
Astragalus oxyphysus	Mt. Diablo milkvetch, Diablo locoweed	UPL
Lotus strigosus	hairy lotus	UPL
Lotus wrangelianus	California lotus	UPL
Lupinus albifrons var. *albifrons*	silver bush lupine	UPL
Lupinus bicolor	miniature lupine, Lindley's annual lupine	UPL
Lupinus microcarpus var. *microcarpus*	gully/chick lupine	UPL
Lupinus succulentus	arroyo lupine	UPL
Medicago sp.	burclover	N/A
*Medicago lupulina**	black medic	FAC
*Medicago polymorpha**	burclover	UPL
*Melilotus indicus**	sour clover, Indian melilot	FAC
Trifolium sp.	clover	N/A
Trifolium albopurpureum var. albopurpureum	Indian clover	UPL
Trifolium ciliolatum	tree clover	UPL
Trifolium depauperatum var. amplectens	pale bladder clover	FAC-
Trifolium depauperatum var. truncatum	dwarf sack clover	FAC-
Trifolium willdenovii	tomcat clover	UPL
GERANIACEAE - Geranium Family		
*Erodium botrys**	broad-leaved filaree	UPL
*Erodium brachycarpum**	short fruited filaree	UPL
*Erodium cicutarium**	red-stemmed filaree	UPL
*Erodium moschatum**	white-stemmed filaree	UPL
JUGLANDACEAE - Walnut Family		
*Juglans hindsii**	Northern California blacck walnut	FAC
LAMIACEAE - Mint Family		
*Lamium amplexicaule**	henbit	UPL
LOASACEAE - Loasa Family		
Mentzelia affinis	yellow blazingstar	UPL
Mentzelia dispersa	bushy blazingstar	UPL
Mentzelia pectinata	San Joaquin blazingstar	UPL
Mentzelia veatchiana	Veatch's blazingstar	UPL
MALVACEAE - Mallow Family		
*Malva parviflora**	cheeseweed	UPL
MONTIACEAE - Montia Family		
Calandrinia ciliata	redmaids	FACU*
Claytonia exigua ssp. glauca	blue leaved spring beauty	UPL
MORACEAE - Mulberry Family		
*Morus alba**	white/silkworm mulberry	NI
MYRTACEAE - Myrtle Family		
*Eucalyptus sp.**		UPL

ONAGRACEAE - Evening primrose Family		
Camissonia graciliflora	hill suncup	UPL
Clarkia sp.		UPL
PAPAVERACEAE - Poppy Family		
Eschscholzia californica	California poppy	UPL
Platystemon californicus	California cream cups	UPL
PLANTAGINACEAE - Plantain Family		
Plantago erecta	California plantain	UPL
Veronica peregrina ssp. xalapensis	neckweed	OBL
*Veronica persica**	bird's eye speedwell	UPL
POACEAE - Grass Family		
*Avena barbata**	slender wild oat	UPL
*Avena fatua**	wild oat	UPL
*Bromus diandrus**	ripgut brome	UPL
*Bromus hordeaceus**	soft chess	FACW-
*Bromus madritensis ssp. rubens**	foxtail chess, red brome	UPL
*Cynodon dactylon**	bermuda grass	FAC
Deschampsia danthonioides	annual hairgrass	FACW*
Distichlis spicata	saltgrass	FACW*
Festuca idahoensis	Idaho/blue fescue	NI
*Hordeum marinum ssp. gussoneanum**	Mediterranean barley	FAC
*Hordeum murinum ssp. leporinum**	barnyard/farmer's foxtail, foxtail barley	NI
*Lamarckia aurea**	goldentop	UPL
Melica californica	California melicgrass	UPL
Muhlenbergia rigens	deergrass	FACW
*Poa annua**	annual bluegrass	FACW-
Puccinellia nuttalliana	Nuttall's alkaligrass	OBL
Schismus sp.	Mediterranean grass	UPL
*Schismus arabicus**	Mediterranean grass	UPL
*Schismus barbatus**	common Mediterranean grass	UPL
*Triticum aestivum**	common wheat	UPL
*Vulpia bromoides**	brome fescue	FACW
Vulpia microstachys var. ciliata	Eastwood fescue	UPL
Vulpia microstachys var. pauciflora	Pacific fescue	UPL
*Vulpia myuros var. hirsuta**	hairy rat-tail fescue	FACU*
*Vulpia myuros var. myuros**	rat-tail fescue	FACU*
POLEMONIACEAE - Phlox Family		
Gilia clivorum	purplespot gilia	UPL
Gilia tricolor ssp. tricolor	bird's eyes	UPL
Leptosiphon bicolor	true babystars	UPL
Leptosiphon ambiguus	Serpentine leptosiphon	UPL
Linanthus dichotomus	evening snow	UPL
Microsteris gracilis	slender phlox	FACU*
POLYGONACEAE - Buckwheat Family		
Eriogonum sp.	buckwheat	UPL
Eriogonum gracillimum	rose & white buckwheat	UPL
Rumex sp.	dock	
PRIMULACEAE - Primrose Family		
Dodecatheon clevelandii ssp. patulum	shooting star	UPL
RANUNCULACEAE - Buttercup Family		

Delphinium gypsophilum ssp. gypsophilum	Panoche Creek larkspur	UPL
Delphinium patens ssp. patens	zigzag larkspur	UPL
Delphinium cf. recurvatum	recurved larkspur	
Ranunculus californicus	California buttercup	FAC
ROSACEAE - Rose Family		
Aphanes occidentalis	lady's mantle	UPL
SALICACEAE - Willow Family		
Salix laevigata	red willow	~NI
SAXIFRAGACEAE - Saxifrage Family		
Saxifraga californica	California saxifrage	UPL
SCROPHULARIACEAE – Figwort Family		
Castilleja attenuata	valley tassels	UPL
Castilleja exserta ssp. exserta	purple owls clover	UPL
Triphysaria eriantha ssp. eriantha	butter 'n' eggs	UPL
SOLANACEAE - Nightshade Family		
Datura sp.	thornapple/jimsonweed	UPL
*Nicotiana glauca**	tree tobacco	FAC
Solanum umbelliferum	blue witch	UPL
TAMARICACEAE - Tamarisk Family		
*Tamarix aphylla**	athel	FACW-
THEMIDACEAE - Cluster Lily Family		
Brodiaea terrestris ssp. kernensis	Kern brodiaea	UPL
Dichelostemma capitatum ssp. capitatum	blue dicks	UPL
Muilla maritima	sea muilla	UPL
URTICACEAE - Nettle Family		
*Urtica urens**	dwarf nettle	UPL

APPENDIX B: PLANTS OBSERVED ON THE SITE BY SECTION

The table below details the plant species observed on the Panoche Valley solar farm site by section during the rare plant surveys conducted by LOA in March and April 2010.

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Achyrachaena mollis	X	X				X	X	X		X	
Allium crispum			X								
Allium howellii var. *howellii*							X				X
Amsinckia menziesii var. intermedia	X	X	X	X	X	X	X	X	X	X	X
Amsinckia menziesii var. menziesii	X	X	X	X	X	X	X	X	X	X	X
Aphanes occidentalis			X								
Artemisia californica			X	X						X	
Astragalus gambelianus	X	X	X	X	X	X	X	X	X	X	X
Astragalus oxyphysus			X					X		X	
Athysanus pusillus					X				X		
*Atriplex cf. semibaccata**		X									X
Atriplex polycarpa							X				
*Avena barbata**	X	X	X	X		X	X	X	X	X	
*Avena fatua**	X								X		
*Brassica nigra**	X							X	X	X	
*Brassica tournefortii**						X				X	X
Brodiaea terrestris ssp. kernensis		X		X						X	
*Bromus diandrus**	X	X		X		X	X	X		X	
*Bromus hordeaceus**	X	X	X	X	X	X	X	X	X	X	X
*Bromus madritensis ssp. rubens**	X	X	X	X	X	X	X	X	X	X	X
Calandrinia ciliata	X	X	X	X	X	X	X	X	X		X
Camissonia graciliflora			X								
*Capsella bursa-pastoris**	X	X	X	X	X	X	X	X	X	X	X
Castilleja attenuata	X	X	X	X		X	X	X		X	
Castilleja exserta ssp. exserta	X	X	X	X	X	X	X	X	X	X	X
*Centaurea melitensis**				X				X	X	X	
Centaurea sp.*										X	
Clarkia sp.		X	X	X		X		X		X	
Claytonia exigua ssp. glauca			X								
*Convolvulus arvensis**				X	X				X	X	
Crassula connata	X	X	X	X	X	X	X	X	X	X	X
Cryptantha decipiens			X								
Cryptantha flaccida				X							
*Cynodon dactylon**			X								
Datura sp.								X			
Delphinium cf. recurvatum		X									
Delphinium gypsophilum ssp. gypsophilum											X
Delphinium patens ssp. patens				X							
Delphinum sp.			X								
Deschampsia danthonioides			X								
*Descurainia sophia**	X					X	X	X	X		

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Descurainia sp.*										X	
Dichelostemma capitatum ssp. capitatum	X	X	X	X	X	X	X	X	X	X	X
Distichlis spicata							X	X		X	
Dodecatheon clevelandii ssp. patulum			X	X					X		
Eremocarpus setigerus	X	X	X	X	X	X	X	X	X	X	X
Ericameria cuneata											X
Ericameria linearifolia			X								
Ericameria sp.			X						X		
Eriogonum gracillimum	X										
Eriogonum sp.				X							
*Erodium botrys**					X						X
*Erodium brachycarpum**	X	X	X	X	X	X	X	X	X	X	X
*Erodium cicutarium**	X	X	X	X	X	X	X	X	X	X	X
*Erodium moschatum**	X	X	X	X	X	X	X	X	X	X	X
*Eruca vesicaria**										X	
Eschscholzia californica	X	X		X		X	X	X	X	X	
*Eucalyptus sp.**		X							X	X	
Festuca idahoensis						X					X
Gilia clivorum	X	X					X			X	X
Gilia tricolor ssp. tricolor	X		X	X		X			X	X	X
Guillenia lasiophylla	X	X	X	X	X	X	X	X	X	X	X
Heliotropium curassavicum				X				X		X	
Hemizonia sp.			X								
*Herniaria hirsuta var. cinerea**	X	X	X	X	X	X	X	X	X	X	X
Heterotheca oregona var. rudis								X	X	X	X
*Hirschfeldia incana**			X		X		X	X	X	X	X
*Hordeum marinum ssp. gussoneanum**	X	X	X	X	X	X	X	X	X	X	X
*Hordeum murinum ssp. leporinum**	X	X	X	X	X	X	X	X	X	X	X
*Hypochaeris glabra**			X	X							
Isocoma menziesii var. vernonioides										X	
*Juglans hindsii**											
*Lamarckia aurea**			X								
*Lamium amplexicaule**					X						
Lasthenia californica	X	X		X	X	X	X	X	X	X	X
Layia platyglossa	X	X	X	X	X	X	X	X		X	X
Layia sp.				X							
Lepidium dictyotum var. acutidens		X	X		X						
Lepidium dictyotum var. dictyotum		X	X	X	X		X	X	X	X	X
Lepidium nitidum var. nitidum	X	X	X	X	X	X	X	X	X	X	X
Leptosiphon ambiguus		X		X							
Leptosiphon bicolor		X		X							
Linanthus dichotomus		X		X							
Logfia filaginoides	X	X	X	X		X				X	X
Lomatium utriculatum			X								
Lotus strigosus			X								
Lotus wrangelianus	X	X	X	X		X	X	X	X	X	X

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Lupinus albifrons var. *albifrons*			X								
Lupinus bicolor		X	X	X					X	X	
Lupinus microcarpus var. *microcarpus*		X					X			X	X
Lupinus succulentus	X	X	X			X	X	X		X	X
Malacothrix coulteri							X	X		X	
*Malva parviflora**	X	X	X	X	X	X	X	X		X	X
*Matricaria matricarioides**	X	X	X	X	X	X	X	X	X	X	X
*Medicago lupulina**					X						
*Medicago polymorpha**	X	X	X			X		X	X	X	
Medicago sp.							X				X
Melica californica	X	X					X	X			
*Melilotus indicus**						X		X	X	X	
Mentzelia affinis						X					
Mentzelia dispersa								X			
Mentzelia pectinata									X		
Mentzelia veatchiana			X								
Microseris cf. *sylvatica*			X								
Microseris douglasii ssp. *douglasii*		X	X		X	X	X	X	X	X	
Microseris sp.				X							X
Microsteris gracilis		X	X	X	X			X	X	X	X
Monolopia major	X										
Monolopia sp.											X
Monolopia stricta						X	X	X	X		
*Morus alba**										X	
Muhlenbergia rigens											X
Muilla maritima		X	X	X						X	
*Nicotiana glauca**										X	
Pectocarya linearis ssp. ferocula			X								
Pectocarya penicillata		X				X	X	X	X	X	
Phacelia ciliata			X	X	X		X	X	X		X
Plagiobothrys acanthocarpus	X	X	X	X	X	X	X	X	X	X	X
Plagiobothrys canescens	X	X	X	X	X	X	X	X	X	X	X
Plagiobothrys humistratus		X		X				X	X		
Plagiobothrys nothofulvus			X		X		X		X	X	X
Plagiobothrys stipitatus var. micranthus		X			X		X	X	X	X	
Plantago erecta	X	X	X	X	X		X	X	X	X	X
Platystemon californicus				X				X		X	X
*Poa annua**		X	X	X			X		X		X
Psilocarphus brevissimus var. brevissimus		X	X							X	
Puccinellia nuttalliana		X	X	X					X		X
Ranunculus californicus			X								
Raphanus raphanistrum						X	X			X	
Rumex sp.			X	X					X		
Salix laevigata									X		
*Salsola tragus**			X				X				X
Sanicula bipinnatifida		X	X	X						X	

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Sanicula crassicaulis		X	X	X						X	
Saxifraga californica			X								
*Schismus arabicus**		X	X		X		X		X	X	X
*Schismus barbatus**	X					X		X	X	X	
Schismus sp.				X							
Senecio flaccidus var. douglasii			X	X	X					X	
*Senecio vulgaris**	X	X	X	X	X	X	X	X	X	X	X
*Sinapis arvensis**		X				X		X	X	X	X
*Sisymbrium irio**	X	X	X	X	X	X	X	X	X	X	X
*Sisymbrium orientale**						X		X	X	X	
Solanum umbelliferum								X			
*Sonchus oleraceus**		X								X	X
*Spergularia rubra**		X									
Stellaria media	X	X	X	X	X				X	X	X
Stellaria nitens	X	X	X	X	X	X		X	X	X	
Stephanomeria sp.								X	X		
*Tamarix aphylla**									X		
Tauschia hartwegii		X	X								
Thysanocarpus curvipes	X		X	X	X				X		X
Tragopogon sp.			X								
Trifolium albopurpureum var. albopurpureum	X	X	X	X		X		X	X	X	X
Trifolium ciliolatum		X				X		X		X	
Trifolium depauperatum var. amplectens		X			X		X			X	
Trifolium depauperatum var. truncatum	X	X	X	X		X	X	X	X	X	X
Trifolium sp.											X
Trifolium willdenovii	X	X	X	X	X	X	X	X	X	X	
Triphysaria eriantha ssp. eriantha		X	X	X			X				X
*Triticum aestivum**		X								X	
Tropidocarpum gracile	X	X	X	X	X				X	X	X
Uropappus lindleyi			X	X							
*Urtica urens**				X					X		
Veronica peregrina ssp. xalapensis			X								
*Veronica persica**		X							X	X	
*Vulpia bromoides**	X	X	X	X	X	X	X	X	X	X	X
Vulpia microstachys var. ciliata			X	X	X				X		X
Vulpia microstachys var. pauciflora	X	X	X			X	X	X		X	
*Vulpia myuros var. hirsuta**									X		
*Vulpia myuros var. myuros**	X	X	X	X	X	X	X	X	X	X	X

APPENDIX C

CALIFORNIA NATIVE PLANT SOCIETY BOTANICAL SURVEY GUIDELINES
&
CALIFORNIA DEPARTMENT OF FISH AND GAME PROTOCOLS FOR SURVEYING AND EVALUATING IMPACTS TO SPECIAL STATUS NATIVE PLANT POPULATIONS AND NATURAL COMMUNITIES

CNPS Botanical Survey Guidelines

(from CNPS *Inventory*, 6th Edition, 2001)

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how surveys should be conducted, and what information should be contained in the survey report. The California Native Plant Society recommends that lead agencies not accept the results of surveys unless they are conducted and reported according to these guidelines.

1. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all botanical resources, including special status plants (rare, threatened, and endangered plants) and plant (vegetation) communities. Special status plants are not limited to those that have been listed by state and federal agencies but include any plants that, based on all available data, can be shown to be rare, threatened, or endangered under the following definitions:

A species, subspecies, or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.[1]

Rare plant (vegetation) communities are those communities that are of highly limited distribution. These communities may or may not contain special status plants. The most current version of the California Natural Diversity Database's *List of California Terrestrial Natural Communities*[2] should be used as a guide to the names and status of communities.

Consistent with the California Native Plant Society's goal of preserving plant biodiversity on a regional and local scale, and with California Environmental Quality Act environmental impact assessment criteria[3], surveys should also assess impacts to locally significant plants. Both plants and plant communities can be considered significant if their local occurrence is on the outer limits of known distribution, a range extension, a rediscovery, or rare or uncommon in a local context (such as within a county or region). Lead agencies should address impacts to these locally unique botanical resources regardless of their status elsewhere in the state.

2. Botanical surveys must be conducted to determine if, or to the extent that, special status or locally significant plants and plant communities will be affected by a proposed project when any natural vegetation occurs on the site and the project has the potential for direct or indirect effects on vegetation.

3. Those conducting botanical surveys must possess the following qualifications:

a. Experience conducting floristic field surveys;
b. Knowledge of plant taxonomy and plant community ecology and classification;
c. Familiarity with the plants of the area, including special status and locally significant plants;
d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
e. Experience with analyzing impacts of a project on native plants and communities.

4. Botanical surveys should be conducted in a manner that will locate any special status or locally significant plants or plant communities that may be present. Specifically, botanical surveys should be:

a. Conducted in the field at the proper times of year when special status and locally significant plants are both evident and identifiable. When special status plants are known to occur in the type(s) of habitat present in the project area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the plants are identifiable at the time of survey.
b. Floristic in nature. A floristic survey requires that every plant observed be identified to species, subspecies, or variety as applicable. In order to properly characterize the site, a complete list of plants observed on the site shall be included in every botanical survey report. In addition, a sufficient number of visits spaced throughout the growing season is necessary to prepare an accurate inventory of all plants that exist on the

site. The number of visits and the timing between visits must be determined by geographic location, the plant communities present, and the weather patterns of the year(s) in which the surveys are conducted.

c. Conducted in a manner that is consistent with conservation ethics and accepted plant collection and documentation techniques[4,5]. Collections (voucher specimens) of special status and locally significant plants should be made, unless such actions would jeopardize the continued existence of the population. A single sheet should be collected and deposited at a recognized public herbarium for future reference. All collections shall be made in accordance with applicable state and federal permit requirements. Photography may be used to document plant identification only when the population cannot withstand collection of voucher specimens.
d. Conducted using systematic field techniques in all habitats of the site to ensure a thorough coverage of potential impact areas. All habitats within the project site must be surveyed thoroughly in order to properly inventory and document the plants present. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity.
e. Well documented. When a special status plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form, accompanied by a copy of the appropriate portion of a 7.5-minute topographic map with the occurrence mapped, shall be completed, included within the survey report, and separately submitted to the California Natural Diversity Database. Population boundaries should be mapped as accurately as possible. The number of individuals in each population should be counted or estimated, as appropriate.

5. Complete reports of botanical surveys shall be included with all environmental assessment documents, including Negative Declarations and Mitigated Negative Declarations, Timber Harvesting Plans, Environmental Impact Reports, and Environmental Impact Statements. Survey reports shall contain the following information:

a. Project location and description, including:
    1. A detailed map of the location and footprint of the proposed project.
    2. A detailed description of the proposed project, including one-time activities and ongoing activities that may affect botanical resources.
    3. A description of the general biological setting of the project area.
b. Methods, including:
    1. Survey methods for each of the habitats present, and rationale for the methods used.
    2. Description of reference site(s) visited and phenological development of the target special status plants, with an assessment of any conditions differing from the project site that may affect their identification.
    3. Dates of surveys and rationale for timing and intervals; names of personnel conducting the surveys; and total hours spent in the field for each surveyor on each date.
    4. Location of deposited voucher specimens and herbaria visited.
c. Results, including:
    1. A description and map of the vegetation communities on the project site. The current standard for vegetation classification, *A Manual of California Vegetation*[6], should be used as a basis for the habitat descriptions and the vegetation map. If another vegetation classification system is used, the report must reference the system and provide the reason for its use.
    2. A description of the phenology of each of the plant communities at the time of each survey date.
    3. A list of all plants observed on the project site using accepted scientific nomenclature, along with any special status designation. The reference(s) used for scientific nomenclature shall be cited.
    4. Written description and detailed map(s) showing the location of each special status or locally significant plant found, the size of each population, and method used to estimate or census the population.
    5. Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms and accompanying maps.
d. Discussion, including:
    1. Any factors that may have affected the results of the surveys (e.g., drought, human disturbance, recent fire).
    2. Discussion of any special local or range-wide significance of any plant population or community on the site.
    3. An assessment of potential impacts. This shall include a map showing the distribution of special status and locally significant plants and communities on the site in relation to the proposed activities. Direct, indirect, and cumulative impacts to the plants and communities shall be discussed.
    4. Recommended measures to avoid and/or minimize direct, indirect, and cumulative impacts.
e. References cited and persons contacted.

f. Qualifications of field personnel including any special experience with the habitats and special status plants present on the site.

3.3.2 References Cited

[1] California Environmental Quality Act Guidelines, §15065 and §15380.

[2] List of California Terrestrial Natural Communities. California Department of Fish and Game Natural Diversity Database. Sacramento, CA.

[3] California Environmental Quality Act Guidelines, Appendix G (Initial Study Environmental Checklist).

[4] Collecting Guidelines and Documentation Techniques. California Native Plant Society Policy (adopted March 4, 1995).

[5] Ferren, W.R., Jr., D.L. Magney, and T.A. Sholars. 1995. The Future of California Floristics and Systematics: Collecting Guidelines and Documentation Techniques. *Madroño* 42(2):197-210.

[6] Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, CA. 471 pp.

Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities

State of California
CALIFORNIA NATURAL RESOURCES AGENCY
Department of Fish and Game
November 24, 2009[1]

INTRODUCTION AND PURPOSE

The conservation of special status native plants and their habitats, as well as natural communities, is integral to maintaining biological diversity. The purpose of these protocols is to facilitate a consistent and systematic approach to the survey and assessment of special status native plants and natural communities so that reliable information is produced and the potential of locating a special status plant species or natural community is maximized. They may also help those who prepare and review environmental documents determine when a botanical survey is needed, how field surveys may be conducted, what information to include in a survey report, and what qualifications to consider for surveyors. The protocols may help avoid delays caused when inadequate biological information is provided during the environmental review process; assist lead, trustee and responsible reviewing agencies to make an informed decision regarding the direct, indirect, and cumulative effects of a proposed development, activity, or action on special status native plants and natural communities; meet California Environmental Quality Act (CEQA)[2] requirements for adequate disclosure of potential impacts; and conserve public trust resources.

DEPARTMENT OF FISH AND GAME TRUSTEE AND RESPONSIBLE AGENCY MISSION

The mission of the Department of Fish and Game (DFG) is to manage California's diverse wildlife and native plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. DFG has jurisdiction over the conservation, protection, and management of wildlife, native plants, and habitat necessary to maintain biologically sustainable populations (Fish and Game Code §1802). DFG, as trustee agency under CEQA §15386, provides expertise in reviewing and commenting on environmental documents and makes protocols regarding potential negative impacts to those resources held in trust for the people of California.

Certain species are in danger of extinction because their habitats have been severely reduced in acreage, are threatened with destruction or adverse modification, or because of a combination of these and other factors. The California Endangered Species Act (CESA) provides additional protections for such species, including take prohibitions (Fish and Game Code §2050 *et seq.*). As a responsible agency, DFG has the authority to issue permits for the take of species listed under CESA if the take is incidental to an otherwise lawful activity; DFG has determined that the impacts of the take have been minimized and fully mitigated; and, the take would not jeopardize the continued existence of the species (Fish and Game Code §2081). Surveys are one of the preliminary steps to detect a listed or special status plant species or natural community that may be impacted significantly by a project.

DEFINITIONS

Botanical surveys provide information used to determine the potential environmental effects of proposed projects on all special status plants and natural communities as required by law (i.e., CEQA, CESA, and Federal Endangered Species Act (ESA)). Some key terms in this document appear in **bold font** for assistance in use of the document.

For the purposes of this document, **special status plants** include all plant species that meet one or more of the following criteria[3]:

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1 This document replaces the DFG document entitled "Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities."

2 http://ceres.ca.gov/ceqa/

3 Adapted from the East Alameda County Conservation Strategy available at http://www.fws.gov/sacramento/EACCS/Documents/080228_Species_Evaluation_EACCS.pdf

- Listed or proposed for listing as threatened or endangered under ESA or candidates for possible future listing as threatened or endangered under the ESA (50 CFR §17.12).

- Listed[4] or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 *et seq.*). A species, subspecies, or variety of plant is **endangered** when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is **threatened** when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067).

- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 *et seq*.). A plant is **rare** when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).

- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:

  - Species considered by the California Native Plant Society (CNPS) to be "rare, threatened or endangered in California" (Lists 1A, 1B and 2);

  - Species that may warrant consideration on the basis of local significance or recent biological information[5];

  - Some species included on the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2008)[6].

- Considered a **locally significant species,** that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or a species occurring on an uncommon soil type.

Special status natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special status species or their habitat. The most current version of the Department's *List of California Terrestrial Natural Communities*[7] indicates which natural communities are of special status given the current state of the California classification.

Most types of wetlands and riparian communities are considered special status natural communities due to their limited distribution in California. These natural communities often contain special status plants such as those described above. These protocols may be used in conjunction with protocols formulated by other agencies, for example, those developed by the U.S. Army Corps of Engineers to delineate jurisdictional wetlands[8] or by the U.S. Fish and Wildlife Service to survey for the presence of special status plants[9].

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4 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

5 In general, CNPS List 3 plants (plants about which more information is needed) and List 4 plants (plants of limited distribution) may not warrant consideration under CEQA §15380. These plants may be included on special status plant lists such as those developed by counties where they would be addressed under CEQA §15380. List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not. List 3 and 4 plants are also included in the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List.* [Refer to the current online published list available at: http://www.dfg.ca.gov/biogeodata.] Data on Lists 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking.

6 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

7 http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf. The rare natural communities are asterisked on this list.

8 http://www.wetlands.com/regs/tlpge02e.htm

9 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

BOTANICAL SURVEYS

Conduct botanical surveys prior to the commencement of any activities that may modify vegetation, such as clearing, mowing, or ground-breaking activities. It is appropriate to conduct a botanical field survey when:

- Natural (or naturalized) vegetation occurs on the site, and it is unknown if special status plant species or natural communities occur on the site, and the project has the potential for direct or indirect effects on vegetation; or
- Special status plants or natural communities have historically been identified on the project site; or
- Special status plants or natural communities occur on sites with similar physical and biological properties as the project site.

SURVEY OBJECTIVES

Conduct field surveys in a manner which maximizes the likelihood of locating special status plant species or special status natural communities that may be present. Surveys should be **floristic in nature**, meaning that every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status. "Focused surveys" that are limited to habitats known to support special status species or are restricted to lists of likely potential species are not considered floristic in nature and are not adequate to identify all plant taxa on site to the level necessary to determine rarity and listing status. Include a list of plants and natural communities detected on the site for each botanical survey conducted. More than one field visit may be necessary to adequately capture the floristic diversity of a site. An indication of the prevalence (estimated total numbers, percent cover, density, etc.) of the species and communities on the site is also useful to assess the significance of a particular population.

SURVEY PREPARATION

Before field surveys are conducted, compile relevant botanical information in the general project area to provide a regional context for the investigators. Consult the CNDDB[10] and BIOS[11] for known occurrences of special status plants and natural communities in the project area prior to field surveys. Generally, identify vegetation and habitat types potentially occurring in the project area based on biological and physical properties of the site and surrounding ecoregion[12], unless a larger assessment area is appropriate. Then, develop a list of special status plants with the potential to occur within these vegetation types. This list can serve as a tool for the investigators and facilitate the use of reference sites; however, special status plants on site might not be limited to those on the list. Field surveys and subsequent reporting should be comprehensive and floristic in nature and not restricted to or focused only on this list. Include in the survey report the list of potential special status species and natural communities, and the list of references used to compile the background botanical information for the site.

SURVEY EXTENT

Surveys should be comprehensive over the entire site, including areas that will be directly or indirectly impacted by the project. Adjoining properties should also be surveyed where direct or indirect project effects, such as those from fuel modification or herbicide application, could potentially extend offsite. Pre-project surveys restricted to known CNDDB rare plant locations may not identify all special status plants and communities present and do not provide a sufficient level of information to determine potential impacts.

FIELD SURVEY METHOD

Conduct surveys using **systematic field techniques** in all habitats of the site to ensure thorough coverage of potential impact areas. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity, which determines the distance at which plants can be identified. Conduct surveys by walking over the entire site to ensure thorough coverage, noting all plant taxa

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10 Available at http://www.dfg.ca.gov/biogeodata/cnddb

11 http://www.bios.dfg.ca.gov/

12 Ecological Subregions of California, available at http://www.fs.fed.us/r5/projects/ecoregions/toc.htm

observed. The level of effort should be sufficient to provide comprehensive reporting. For example, one person-hour per eight acres per survey date is needed for a comprehensive field survey in grassland with medium diversity and moderate terrain[13], with additional time allocated for species identification.

TIMING AND NUMBER OF VISITS

Conduct surveys in the field at the time of year when species are both evident and identifiable. Usually this is during flowering or fruiting. Space visits throughout the growing season to accurately determine what plants exist on site. Many times this may involve multiple visits to the same site (e.g. in early, mid, and late-season for flowering plants) to capture the floristic diversity at a level necessary to determine if special status plants are present[14]. The timing and number of visits are determined by geographic location, the natural communities present, and the weather patterns of the year(s) in which the surveys are conducted.

REFERENCE SITES

When special status plants are known to occur in the type(s) of habitat present in the project area, observe reference sites (nearby accessible occurrences of the plants) to determine whether those species are identifiable at the time of the survey and to obtain a visual image of the target species, associated habitat, and associated natural community.

USE OF EXISTING SURVEYS

For some sites, floristic inventories or special status plant surveys may already exist. Additional surveys may be necessary for the following reasons:

- Surveys are not current[15]; or
- Surveys were conducted in natural systems that commonly experience year to year fluctuations such as periods of drought or flooding (e.g. vernal pool habitats or riverine systems); or
- Surveys are not comprehensive in nature; or fire history, land use, physical conditions of the site, or climatic conditions have changed since the last survey was conducted[16]; or
- Surveys were conducted in natural systems where special status plants may not be observed if an annual above ground phase is not visible (e.g. flowers from a bulb); or
- Changes in vegetation or species distribution may have occurred since the last survey was conducted, due to habitat alteration, fluctuations in species abundance and/or seed bank dynamics.

NEGATIVE SURVEYS

Adverse conditions may prevent investigators from determining the presence of, or accurately identifying, some species in potential habitat of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any given year. Discuss such conditions in the report.

The failure to locate a known special status plant occurrence during one field season does not constitute evidence that this plant occurrence no longer exists at this location, particularly if adverse conditions are present. For example, surveys over a number of years may be necessary if the species is an annual plant having a persistent, long-lived seed bank and is known not to germinate every year. Visits to the site in more

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13 Adapted from U.S. Fish and Wildlife Service kit fox survey guidelines available at www.fws.gov/sacramento/es/documents/kitfox_no_protocol.pdf

14 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

15 Habitats, such as grasslands or desert plant communities that have annual and short-lived perennial plants as major floristic components may require yearly surveys to accurately document baseline conditions for purposes of impact assessment. In forested areas, however, surveys at intervals of five years may adequately represent current conditions. For forested areas, refer to "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

16 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/botanicalinventories.pdf

than one year increase the likelihood of detection of a special status plant especially if conditions change. To further substantiate negative findings for a known occurrence, a visit to a nearby reference site may ensure that the timing of the survey was appropriate.

REPORTING AND DATA COLLECTION

Adequate information about special status plants and natural communities present in a project area will enable reviewing agencies and the public to effectively assess potential impacts to special status plants or natural communities[17] and will guide the development of minimization and mitigation measures. The next section describes necessary information to assess impacts. For comprehensive, systematic surveys where no special status species or natural communities were found, reporting and data collection responsibilities for investigators remain as described below, excluding specific occurrence information.

SPECIAL STATUS PLANT OR NATURAL COMMUNITY OBSERVATIONS

Record the following information for locations of each special status plant or natural community detected during a field survey of a project site.

- A detailed map (1:24,000 or larger) showing locations and boundaries of each special status species occurrence or natural community found as related to the proposed project. Mark occurrences and boundaries as accurately as possible. Locations documented by use of global positioning system (GPS) coordinates must include the datum[18] in which they were collected;
- The site-specific characteristics of occurrences, such as associated species, habitat and microhabitat, structure of vegetation, topographic features, soil type, texture, and soil parent material. If the species is associated with a wetland, provide a description of the direction of flow and integrity of surface or subsurface hydrology and adjacent off-site hydrological influences as appropriate;
- The number of individuals in each special status plant population as counted (if population is small) or estimated (if population is large);
- If applicable, information about the percentage of individuals in each life stage such as seedlings vs. reproductive individuals;
- The number of individuals of the species per unit area, identifying areas of relatively high, medium and low density of the species over the project site; and
- Digital images of the target species and representative habitats to support information and descriptions.

FIELD SURVEY FORMS

When a special status plant or natural community is located, complete and submit to the CNDDB a California Native Species (or Community) Field Survey Form[19] or equivalent written report, accompanied by a copy of the relevant portion of a 7.5 minute topographic map with the occurrence mapped. Present locations documented by use of GPS coordinates in map and digital form. Data submitted in digital form must include the datum[20] in which it was collected. If a potentially undescribed special status natural community is found on the site, document it with a Rapid Assessment or Relevé form[21] and submit it with the CNDDB form.

VOUCHER COLLECTION

Voucher specimens provide verifiable documentation of species presence and identification as well as a public record of conditions. This information is vital to all conservation efforts. Collection of voucher specimens should

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17 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata. For Timber Harvest Plans (THPs) please refer to the "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

18 NAD83, NAD27 or WGS84

19 http://www.dfg.ca.gov/biogeodata

20 NAD83, NAD27 or WGS84

21 http://www.dfg.ca.gov/biogeodata/vegcamp/veg_publications_protocols.asp

be conducted in a manner that is consistent with conservation ethics, and is in accordance with applicable state and federal permit requirements (e.g. incidental take permit, scientific collection permit). Voucher collections of special status species (or suspected special status species) should be made only when such actions would not jeopardize the continued existence of the population or species.

Deposit voucher specimens with an indexed regional herbarium[22] no later than 60 days after the collections have been made. Digital imagery can be used to supplement plant identification and document habitat. Record all relevant permittee names and permit numbers on specimen labels. A collecting permit is required prior to the collection of State-listed plant species[23].

BOTANICAL SURVEY REPORTS

Include reports of botanical field surveys containing the following information with project environmental documents:

- **Project and site description**
  - A description of the proposed project;
  - A detailed map of the project location and study area that identifies topographic and landscape features and includes a north arrow and bar scale; and,
  - A written description of the biological setting, including vegetation[24] and structure of the vegetation; geological and hydrological characteristics; and land use or management history.
- **Detailed description of survey methodology and results**
  - Dates of field surveys (indicating which areas were surveyed on which dates), name of field investigator(s), and total person-hours spent on field surveys;
  - A discussion of how the timing of the surveys affects the comprehensiveness of the survey;
  - A list of potential special status species or natural communities;
  - A description of the area surveyed relative to the project area;
  - References cited, persons contacted, and herbaria visited;
  - Description of reference site(s), if visited, and phenological development of special status plant(s);
  - A list of all taxa occurring on the project site. Identify plants to the taxonomic level necessary to determine whether or not they are a special status species;
  - Any use of existing surveys and a discussion of applicability to this project;
  - A discussion of the potential for a false negative survey;
  - Provide detailed data and maps for all special plants detected. Information specified above under the headings “Special Status Plant or Natural Community Observations,” and “Field Survey Forms,” should be provided for locations of each special status plant detected;
  - Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms should be sent to the CNDDB and included in the environmental document as an Appendix. It is not necessary to submit entire environmental documents to the CNDDB; and,
  - The location of voucher specimens, if collected.

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22 For a complete list of indexed herbaria, see: Holmgren, P., N. Holmgren and L. Barnett. 1990. Index Herbariorum, Part 1: Herbaria of the World. New York Botanic Garden, Bronx, New York. 693 pp. Or: http://www.nybg.org/bsci/ih/ih.html

23 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

24 A vegetation map that uses the National Vegetation Classification System (http://biology.usgs.gov/npsveg/nvcs.html), for example *A Manual of California Vegetation*, and highlights any special status natural communities. If another vegetation classification system is used, the report should reference the system, provide the reason for its use, and provide a crosswalk to the National Vegetation Classification System.

- **Assessment of potential impacts**
  - A discussion of the significance of special status plant populations in the project area considering nearby populations and total species distribution;
  - A discussion of the significance of special status natural communities in the project area considering nearby occurrences and natural community distribution;
  - A discussion of direct, indirect, and cumulative impacts to the plants and natural communities;
  - A discussion of threats, including those from invasive species, to the plants and natural communities;
  - A discussion of the degree of impact, if any, of the proposed project on unoccupied, potential habitat of the species;
  - A discussion of the immediacy of potential impacts; and,
  - Recommended measures to avoid, minimize, or mitigate impacts.

QUALIFICATIONS

Botanical consultants should possess the following qualifications:

- Knowledge of plant taxonomy and natural community ecology;
- Familiarity with the plants of the area, including special status species;
- Familiarity with natural communities of the area, including special status natural communities;
- Experience conducting floristic field surveys or experience with floristic surveys conducted under the direction of an experienced surveyor;
- Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
- Experience with analyzing impacts of development on native plant species and natural communities.

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APPENDIX D

DELPHINIUM FOUND WITHIN THE APNOCHE SURVEY AREA (MEMORANDUM FROM DR. JAMES PAULUS)

Memorandum May 3, 2010

To: Davinna Ohlson, project manager
From: Jim Paulus

RE: Delphinium found within the Panoche survey area

Populations of native perennial herbs of the genus *Delphinium* were located in Sections 4, 8, 9 and 19 during surveys conducted in March and April. At least one individual in each located population was exhibiting flowers either upon initial detection or when the population was revisited by the project botanist. Identification to species at each location therefore was based upon available leaf, stem and flower characters. In addition, one individual in Section 8 was excavated in order to observe below-ground characters such as root length and strength of the stem attachment.

Plants in Sections 9 were assigned to the relatively common species *D. patens* ssp. *patens*, based upon above-ground characters exhibited by blooming individuals. Plants identified as *D. patens* ssp. *patens* had relatively dark purple-blue sepals, and petals of similar coloration except for whitish margins and white hairs on the upper surfaces. White petals would be expected of both *D. recurvatum* and *D. gypsophilum*. In addition, the flowers exhibited by *D. patens* were relatively small and crowded in comparison to flowers produced by populations located in other Sections. Sepal spurs were consistently less than 10 mm in length, lateral sepals were less than 15 mm in length, and inflorescence internodes were generally less than 20 mm apart. Plants of *D. recurvatum* or *D. gypsophilum* may be expected to produce at least some flowers of greater overall size and greater spacing within the inflorescence. Finally, the lower stems of *D. patens* in Section 9 were consistently glabrous, but were never glaucous and did not appear as reddish as the stems of *Delphinium* located elsewhere within the survey area.

Plants in Section 19 were assigned to the species *D. gypsophilum* ssp. *gypsophilum* (CNPS 4.2, no state or federal listing), based upon above-ground characters. These plants produced up to 25 flowers per inflorescence, spaced up to 3.5 cm apart and held on pedicels of 10-20 mm length. In general, these plants were robust relative to populations found elsewhere within the survey area, with some individuals standing greater than 1 m tall. The expected size of the stem and inflorescence would be smaller for *D. recurvatum*, which is described as generally less than 60 cm tall and with more crowded flowers due to pedicels spaced generally less than 2.5 cm apart. Also, the plants at had exhibited strongly glaucous lower stems, which is typical of *D. gypsophilum* ssp. *gypsophilum*, but not described in literature sources for *D. recurvatum*. Plants in Section 19 exhibited whitish flowers, with little variation between the sepal and petal colors. Some individuals had a small amount of blue in the sepals, which were observed to be reflexed relatively little (or none) even on older flowers. In contrast, *D. recurvatum* flowers would be generally expected to show greater contrast between sepals (bluish) and petals (white), with reflexed sepals. Characters that did not evoke confident separation included the leaves, which were at most ciliate along the edges, and petals that on some individuals were hairier on the inner surfaces relative to the outer surfaces. Expected characters for *D. gypsophilum* would include puberulent leaf margins and equally hairy petal surfaces.

Plants in Sections 4 and 8 could not be confidently separated from the rare species *D. recurvatum* (CNPS 1B.1, no state or federal listing), based upon above-ground characters and below-ground characters of one individual excavated in Section 8. These plants, comprising eight separate groupings (one in Section 8 and seven in Section 4), generally exhibited greater variation in color of petals and sepals, with some plants having light purple-blue sepals that strongly contrasted with the white petals (Figure 1). No plants

in these groups were observed to achieve greater than 60 cm overall height. Stems were observed to be consistently reddish and glabrous, but not glaucous. Inflorescence size (ie, pedicel spacing and length, number of flowers) was consistent with the size expected for *D. recurvatum*, with less than 10 flowers held on glabrous pedicels (ascending at 45 degrees) spaced at about 2 cm apart. Finally, the root system investigated in Section 8 (Figure 2) was highly branched, with a narrowed but firm attachment to the stem. Some plants within each of these groups (all located within an area of about one square mile) exhibited often strong variation in these characters, making positive identification to the species level of taxa difficult. For example, sepal coloration and reflexion varied considerably, with sepal color ranging from white to slightly pinkish (Figure 3) to slightly or rather strongly bluish (Figure 1), and older flowers attaining a range of barely to strongly reflexed. This variability was observed on at least one occasion to occur on a single individual. Petal hairiness with regard to overall amount of hairs and contrast between inner and outer surfaces was also variable, although all plants exhibited some degree of white-hairiness on both the inner and outer surfaces. Leaves were never puberulent, appearing overall glabrous but upon close inspection having ciliate hairs on leaf margins and thus resembling plants separated as *D. gypsophilum* in Section 19. Like all other *Delphinium* found within the survey area except *D. patens* in Section 9, plants in Sections 4 and 8 developed darkish, often greenish, central sepal spots, which is not a character described in the available literature or appearing in herbaria specimen photographs of *D. recurvatum*.

As of this writing, it is speculated that some hybridization has occurred among the *Delphinium* that now populate portions of Sections 4 and 8. Hybridization would account for the relatively high inter- and intra-group variability, and is a generally well-documented trait of local *Delphinium* species. This known tendency for hybridization is thought to be more commonly realized in areas that have been significantly disturbed, and disturbance is certainly in force within the habitat where these plants were found. This area (the flatlands at and near Sections 4 and 8) likely once supported alkaline scrub vegetation, but has been historically used for pasture. It now supports heavily grazed non-native grasslands. Sections 4 and 8 where *Delphinium* populations have survived do not exhibit the tillage lines found in other Sections. The tentatively assigned *Delphinium recurvatum* remains there (despite grazing disturbance), but has possibly responded to habitat alteration by becoming hybridized with other locally occurring species such as *D. gypsophilum* ssp. *gypsophilum* or *D. hesperium* ssp. *pallescens*. It is likely that revisiting all of the populations located in Sections 4 and 8 during fruit and seed maturation will allow more confident assignation to the species level of taxa.

Figure 1. Delphinium cf. recurvatum, Section 4

Figure 3. Delphinium cf. recurvatum, Section 4

Figure 2. Delphinium cf. recurvatum, Section 8

LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

September 17, 2010

Eric Cherniss
Vice President of Project Development
Solargen Energy, Inc.
20400 Stevens Creek Blvd., Suite 700
Cupertino, CA 95014

Subject: Late spring rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California (PN 1297-04c)

Dear Eric:

Live Oak Associates, Inc. (LOA) has completed a focused late spring survey for special status plants (i.e., plants designated as endangered, threatened, or rare, per CDFG, 2010, and plants listed by the California Native Plant Society, per CNPS, 2009) on 4,717 acres of the Panoche Valley Solar Farm site (hereafter referred to as "study area") located along Little Panoche Road in San Benito County, California. Specifically, this survey was conducted to determine whether or not special status plants that would bloom in May, June or July were present within the study area in 2010. The results of a late spring/early fall survey for special status plants that would bloom in August, September, and October have been previously reported in the memorandum "Late summer/early fall rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California (PN1297-04)," date November 24, 2009, and the results of an early spring survey for special status plants that would bloom in March or April have been previously reported in the memorandum "Early spring rare plant surveys for the Panoche Valley Solar Farm project in San Benito County, California (PN 1297-04b)," dated June 17, 2010.

Site Location and Existing Conditions

The project site occurs on the floor of Panoche Valley between the Gabilan Range to the west and the Panoche Hills to the east. The survey area is generally bounded to the west, north, and east by open space and rangelands and to the south by Yturiarte Road (Figure 1). Surrounding lands consist of rangelands used for cattle grazing.

The late spring 2010 study area included the same valley floor topography surveyed in early spring (generally, all or portions of Sections 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, and 16, of Township 15 south, Range 10 east, and Section 19 of Township 15 south, Range 11 east). All seasonally flowing creeks, ephemeral drainages and low swales that exhibited surface waters during the

early spring surveys had become dried as the area entered seasonal drought during the May through July timing of the late spring survey. A few artificially charged ponds associated with cattle grazing remained wet. Rainfall events during the May-July period provided only trace amounts of precipitation. Non-native, annual species, which are clearly dominant throughout the study area, were senescing at the time of the survey. However, the climate in May through early June was unusually cool and moist, providing an excellent opportunity to complete an inventory of later-blooming members of the study area's plant assemblage.

Literature Search and Botanical Survey

A literature search was conducted in order to identify special status plant species that may potentially occur within the study area's available habitats. A review of California Natural Diversity Database records and environmental documentation for area projects, and consultation with local California Department of Fish and Game and Bureau of Land Management botanists (Mr. Dave Hacker, Ms. Ellen Cypher, Mr. Ryan O'Dell) uncovered 23 potentially occurring special status plants (Table 1). Of these, 22 have flowering and fruiting periods (optimal survey times) that fall within the May-July period that was chosen for the late spring botanical survey. This includes San Joaquin woollythreads (*Monolopia congdonii*) and California jewelflower (*Caulanthus californicus*), species that are federally listed as Endangered. The optimal survey times for eight of these species (*Astragalus macrodon*, *Atriplex vallicola*, *Blepharizonia plumosa*, *Cordylanthus mollis* ssp. *hispidus*, *Deinandra halliana*, *Eriogonum vestitum*, *Navarretia nigelliformis* ssp. *radians*, and *Trichostema ovatum*) fall within the survey period chosen for late spring surveys. Due to their normally late development, these species likely would not have been reliably separable from related common species during the March-April early spring survey period.

Table 1. Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2009).

Species	**Status***	**Habitat**	**Blooming Period**
Santa Clara thorn-mint *Acanthomintha lanceolata* Annual herb	CNPS 4	Chaparral, woodland, rocky, often serpentine	March-June
Forked fiddleneck *Amsinckia vernicosa* var. *furcata* Annual herb	CNPS 4	Woodland, grassland	February-May
California androsace *Androsace elongata* ssp. *acuta* Annual herb	CNPS 4	Chaparral, woodland, meadows and seeps, grassland	March-June
Salinas milk-vetch *Astragalus macrodon* Perennial herb	CNPS 4	Chaparral, woodland, grassland	April-July

Table 1 (cont'd.). Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2009).

Species	Status*	Habitat	Blooming Period
Crownscale *Atriplex coronata* var. *coronata* Annual herb	CNPS 4	Chenopod scrub, grasslands, and vernal pools, alkaline soils	March–October
Lost Hills crownscale *Atriplex vallicola* Annual herb	CNPS 1B	Chenopod scrub, grasslands, and vernal pools, alkaline soils.	April–August
Big tarplant *Blepharizonia plumosa* Annual herb	CNPS 1B	Dry areas in grasslands	July–October
Round-leaved filaree *California macrophylla* Annual herb	CNPS 1B	Woodland, grassland	March-May
California jewelflower *Caulanthus californicus* Perennial herb	CNPS 1B Federal Endangered	grasslands (non-alkaline), flats	March-May
Lemmon's jewelflower *Caulanthus coulteri* var. *lemmonii* Perennial herb	CNPS 1B	Pinyon-juniper woodland, grassland	March-May
Hispid bird's-beak *Cordylanthus mollis* ssp. *hispidus* Annual herb	CNPS 1B	Meadows and seeps, playas, grasslands, often damp, alkaline	June–September
Hall's tarplant *Deinandra halliana* Annual herb	CNPS 1B	Chenopod scrub, grassland, clay soils	April-May
Gypsum-loving larkspur *Delphinium gypsophilum* ssp. *gypsophilum* Perennial herb	CNPS 4	Chenopod scrub, grassland, clay soils	February-May
Recurved larkspur *Delphinium recurvatum* Perennial herb	CNPS 1B	Chenopod scrub, grassland, alkaline	March-June
Idria buckwheat *Eriogonum vestitum* Annual herb	CNPS 4	Grasslands, open slopes	April–August
Pale yellow layia *Layia heterotricha* Annual herb	CNPS 1B	Pinyon-juniper woodland, alkaline grassland, clay	March-June

Table 1 (cont'd.). Special status plant species that could potentially occur within the 4,717-acre Panoche Valley Solar Farm study area. Blooming period is taken from CNPS (2009).

Species	Status*	Habitat	Blooming Period
Panoche peppergrass *Lepidium jaredii* ssp. *album* Annual herb	CNPS 1B	Grassland, washes and alluvial fans	February-June
Serpentine leptosiphon *Leptosiphon ambiguus* Annual herb	CNPS 4	Grassland, often serpentine soil	March-June
Showy golden madia *Madia radiata* Annual herb	CNPS 1B	Woodland, grassland	March-May
San Joaquin woollythreads *Monolopia congdonii* Annual herb	CNPS 1B federal Endangered	Chenopod scrub, grassland, sandy	February-May
Shining navarretia *Navarretia nigelliformis* ssp. *radians* Annual herb	CNPS 1B	Woodland, grassland, vernal pools	May-July
Chaparral ragwort *Senecio aphanactis* Annual herb	CNPS 2	Woodland, chaparral	January-April
San Joaquin bluecurls *Trichostema ovatum* Annual herb	CNPS 4	Chenopod scrub, grasslands	July–October

***California Native Plant Society (CNPS) list designations**

1B: Plants Rare, Threatened, or Endangered in California and elsewhere
2: Plants Rare, Threatened, or Endangered in California but more common elsewhere
4: Plants of limited distribution – a watch list

Survey Methods

Known nearby populations of potentially occurring special status plant species were visited in order to develop a search image for these special status species and to verify that the timing of on-site survey work would coincide with the period in which these species can be readily seen and are separable from common local species. Reference populations that were chosen for observation were all located at elevations similar to the study area and within 10 miles of the study area. Reference populations visited in May included forked fiddleneck, crownscale, Lost Hills crownscale, Panoche peppergrass, serpentine leptosiphon, and showy golden madia. The reference populations visited in June included Santa Clara thorn-mint, Salinas milkvetch, gypsum-loving larkspur, Idria buckwheat, and chaparral ragwort. These visits supported the chosen period for the survey as being within the anthesis period of potentially occurring special status species.

Focused special status plant species surveys were conducted by LOA botanists Neal Kramer and Jim Paulus, and by LOA ecologists Nathan Hale, Jessica Celis, Chris Bronny, Colby

Boggs,Yancey Bissonnette, and Wendy Fisher, using the same methodology as described for the Fall 2009 and early spring 2010 surveys (LOA, 2009, 2010). In summary, the survey team walked the entire site in evenly-spaced transects, ensuring 100% visual coverage, during the species' blooming period when they would be evident and most identifiable. Emphasis was placed on areas more likely to support suitable habitat for the target species. All vascular plant species observed were recorded in a field notebook. The survey was floristic, striving to identify all species to the level of taxa needed to separate occurring species from the potentially occurring special status species identified during the literature review (Appendices A and B). The survey methodology is consistent with survey protocols outlined by the CNPS and complied with the most recent California Department of Fish and Game guidelines (Appendix C). Thorough transect surveys were conducted on May 4 through June 4, 2010. Additional surveys conducted July 26-27, 2010, determined the species of 28 *Blepharizonia* populations that were found to be occurring in pre-flowering phenology during the May-June transect surveys.

Results: Plant Species Present in May - July 2010

The results of the May-July 2010 botanical survey indicate greater diversity is present than was suggested by the fall 2009 and early spring 2010 surveys alone. The late spring survey added 37 species to the study area total (239 species as of July 28; Appendix A).

No federal or state listed plant species were found within the study area. No plants that could be confused with either San Joaquin woollythreads or California caulanthus were found in 2010. The survey detected four widely scattered individuals that are classifiable as the CNPS List 1B species recurved larkspur, three populations of CNPS List 4 gypsum-loving larkspur, and four populations of the CNPS List 4 serpentine leptosiphon (Figure 2). All *Blepharizonia* populations visited July 26-27 exhibited mature fruit pappus structures and were determined to be *B. laxa*, a common species. Identifications of special status plants in the field, and the mapping of their populations, were performed by one of the two LOA botanists who participated in all surveys.

Plants classifiable as recurved larkspur (*Delphinium recurvatum*) were found widely scattered in Sections 4 and 13. All occur in relatively flat, open pasture habitat. A technical memorandum prepared by Dr. Paulus discusses non-characteristic traits common to these plants, including weak sepal coloration, and variations that suggest these plants may be hybrids of *D. recurvatum* with the locally occurring, less sensitive *D. gypsophilum* ssp. *gypsophilum* and *D. hesperium* ssp. *pallescens* (Appendix D). Attempts to locate plants with mature fruit and thereby determine species-specific seed characteristics were either thwarted by cows, who had removed nearly all plants of this type that were located during the early spring survey (see Figure 2 in LOA, 2010), or at best resulted in finding sterile, underdeveloped fruits. Sterile fruit production further supports the opinion that plants occurring within the study area are hybrids (LOA, 2010). Sterile fruit and nearly complete destruction by herbivory at flowering are traits of a population or group of plants that is not reproductively self-sustaining.

Gypsum-loving larkspur was found at small occurrences in Sections 13 and 19. Unlike the plants in Sections 4 and 8 (where the plants could not be separated from recurved larkspur), these plants fit well within the expected species characteristics of gypsum-loving larkspur. Individuals appear to be confined rather narrowly to north or northwest-facing slopes associated with gully habitats that are available only at the fringe of the study area. This is the same habitat noted for

reference populations of this species. Previously documented occurrences of this species within the study area were confined to Section 19 (LOA, 2010).

Four populations of serpentine leptosiphon were found in bloom during the survey. Serpentine leptosiphon is an annual species. Blooming in this species was observed as late as June 1. The sole occurrence east of Little Panoche Road, an individual apparently isolated in Section 13, may be considered a waif. All other located populations (Figure 2) numbered in the several hundreds, and occurred in more typical serpentine alluvium near the study area's western edge. Considering these populations with the populations documented during the 2010 early spring survey (LOA, 2010), serpentine leptosiphon occurred in 2010 in very impressive displays to the west of Little Panoche Road. In all, several tens of thousands of plants were observed to bloom and set seed within the study area.

Relic, highly disturbed aquatic features that may be classifiable as vernal pools were located in Sections 4, 8, 10, and 16. These features, despite heavy use by livestock, maintain a species assemblage that is unique within the study area. Species found only at these small and isolated seasonal pools (all pools of this type were observed to perch shallow groundwater until May in 2010) are assigned by Reed (1988) as being typical wetland species in California.

If you have any questions regarding our findings, please contact Michele Korpos at mkorpos@loainc.com or (408) 281-5881 at your earliest convenience.

Sincerely,

Davinna Ohlson
Senior Project Manager
Plant/Wildlife Ecologist

Enclosures

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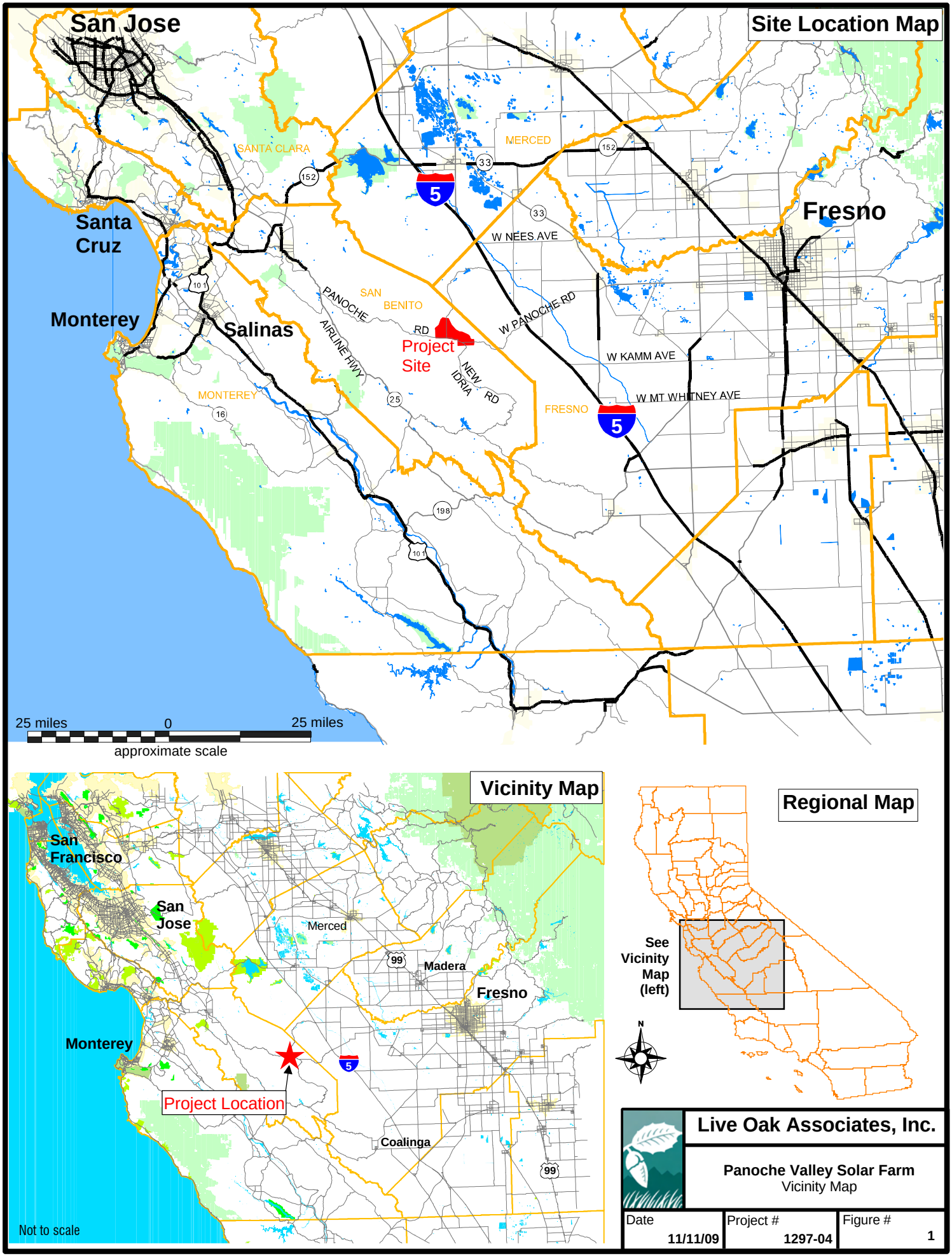
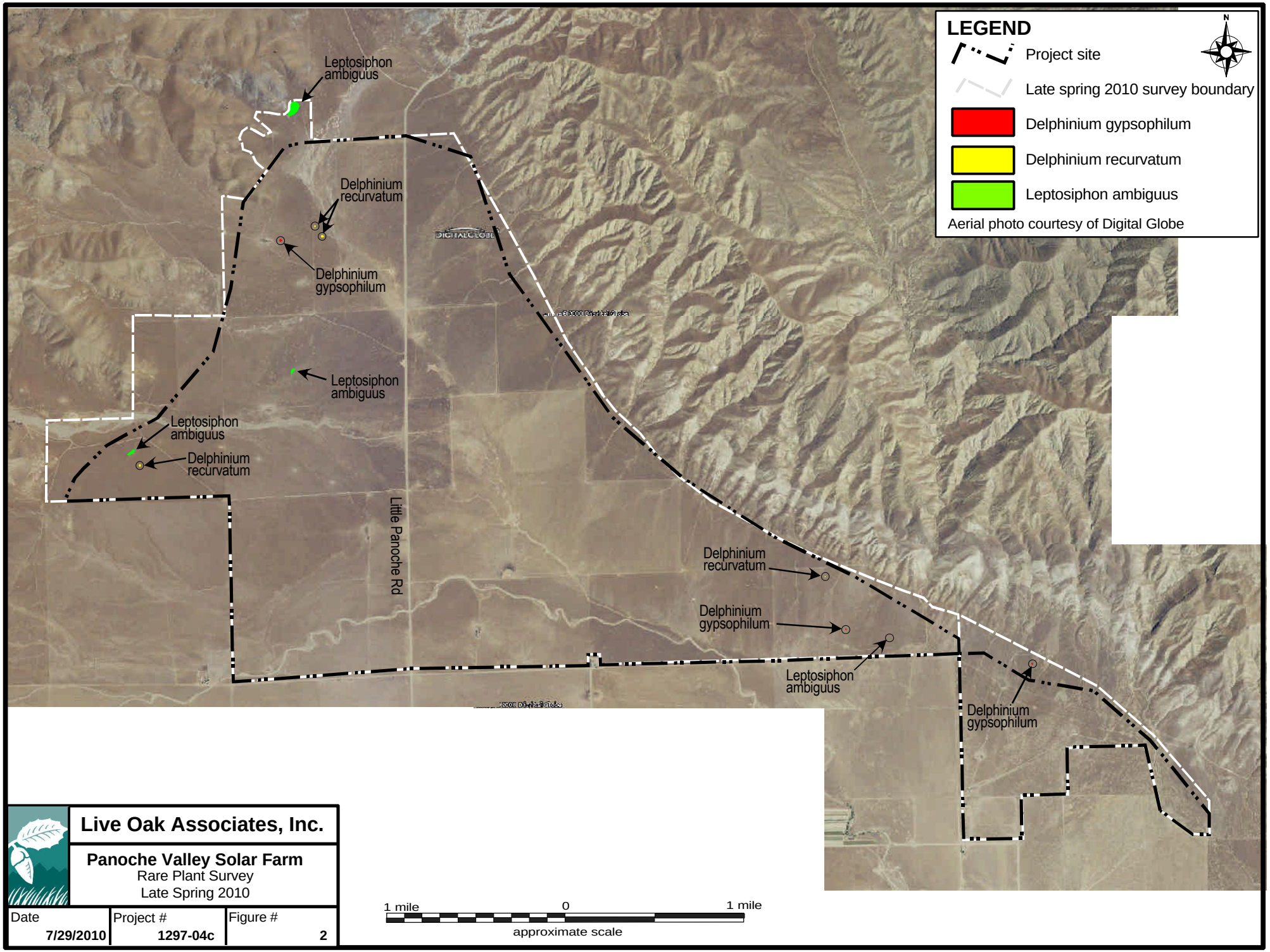


Live Oak Associates, Inc.		
Panoche Valley Solar Farm Vicinity Map		
Date 11/11/09	Project # 1297-04	Figure # 1



Live Oak Associates, Inc.

Panoche Valley Solar Farm
Rare Plant Survey
Late Spring 2010

Date	Project #	Figure #
7/29/2010	1297-04c	2

APPENDIX A: VASCULAR PLANTS OF THE STUDY AREA

The plants species listed below were observed on the Panoche Valley solar farm site during the field survey conducted by Live Oak Associates from May through July 2010. The U.S. Fish and Wildlife Service wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland
+/- - Higher/lower end of category
NI - No investigation

Scientific Name	Common Name	Wetland Status
AMARANTHACEAE - Amaranth Family		
Amaranthus blitoides	mat/prostrate amaranth	FACW
ALLIACEAE - Allium Family		
Allium crispum	crinkled onion	UPL
Allium howellii var. *howellii*	Howell's onion	UPL
APIACEAE - Carrot Family		
Daucus pusillus	wild carrot	UPL
Lomatium dissectum var. *multifidum*	carrot leaved biscut root	UPL
Lomatium utriculatum	common lomatium	UPL
Sanicula bipinnatifida	purple sanicle, snakeroot	UPL
Sanicula crassicaulis	Pacific sanicle, gamble weed	UPL
Tauschia hartwegii	Harweg's umbrellawort/tauschia	UPL
APOCYNACEAE - Dogbane Family		
Asclepias fascicularis	narrow leaf milkweed	FAC
ASTERACEAE - Sunflower Family		
Achyrachaena mollis	blow wives	UPL
Ambrosia acanthicarpa	annual bursage	UPL
*Anthemis cotula**	dog fennel/Mayweed	FACU
Artemisia californica	California sagebrush	UPL
Artemisia douglasiana	mugwort	FACW
Baccharis salicifolia	mulefat	UPL
Blepharizonia sp.	tarweed	UPL
*Carduus pycnocephalus**	Italian thistle	UPL
*Centaurea melitensis**	tocalote	UPL
Centaurea sp.*	knapweed/thistle	UPL
Chaenactis fremontii	pincushion flower	UPL
Conyza canadensis	Canada horsewood	FAC
Deinandra kelloggii	Kellogg's tarweed	UPL
Ericameria sp.	goldenbush	UPL
Ericameria cuneata	cliff/rock/wedgeleaf goldenbush	UPL
Ericameria linearifolia	interior/narrow-leaf goldenbush	UPL
Euthamia occidentalis	western goldentop	OBL
Gnaphalium sp.	cudweed	-
Helianthus annuus	common sunflower	FAC

Hemizonia congesta ssp. luzulifolia	hayfield tarweed	UPL
Heterotheca oregona var. rudis	inland Oregon golden aster	UPL
Holocarpha heermannii	Heermann's tarweed	UPL
Holocarpha obconica	San Joaquin tarweed	UPL
Holocarpha virgata ssp. virgata	narrow tarplant	UPL
*Hypochaeris glabra**	smooth cat's ear	UPL
*Hypochaeris radicata**	rough/hairy cat's ear	NO
Isocoma acradenia	alkali goldenbush	UPL
Isocoma menziesii var. vernonioides	coastal isocoma, coast goldenbush	FACW
Iva axillaris ssp. robustior	poverty weed	FAC
*Lactuca serriola**	prickly lettuce	FAC
Lagophylla ramosissima	common hareleaf	UPL
Lasthenia californica	coast/California/common goldfields	UPL
Layia platyglossa	common tidy-tips	UPL
Layia sp.	tidy-tips	FAC/FACW
Lessingia nemaclada	slender/thread stem lessingia	UPL
Logfia filaginoides	logfia	UPL
Malacothrix coulteri	snakes head	UPL
*Matricaria matricarioides**	pineapple weed	FACU
Micropus californicus var. californicus	slender cottonweed	UPL
Microseris sp.	microseris	UPL
Microseris douglasii ssp. *douglasii*	Douglas' silverpuffs	UPL
Microseris cf. *sylvatica*	sylvan scorzonella	UPL
Monolopia major	cupped monolopia	UPL
Monolopia stricta	Crum's monolopia	UPL
Psilocarphus brevissimus var. brevissimus	dwarf woolly-heads	OBL
Senecio aronicoides	rayless ragwort/groundsel/butterweed	UPL
Senecio flaccidus var. douglasii	Douglas' groundsel/shrubby butterweed	UPL
*Senecio vulgaris**	common groundsel	NI
*Sonchus asper ssp. asper**	sow thistle	FAC
*Sonchus oleraceus**	common sow thistle	NI
Stephanomeria pauciflora	wire lettuce/desert straw	UPL
Tragopogon sp.	salsify, goatsbeard	UPL
Uropappus lindleyi	silverpuffs	UPL
Xanthium spinosum	spiny cocklebur	FAC+
Xanthium strumarium	rough cocklebur	FAC+
BORAGINACEAE - Borage Family		
Amsinckia tessellata	devil's lettuce, checker fiddleneck	UPL
Plagiobothrys stipitatus var. micranthus	stocked popcornflower	OBL
BRASSICACEAE - Mustard Family		
*Descurainia sophia**	flixweed, tansymustard	UPL
*Lepidium draba ssp. draba**	hoary cress	UPL
*Sisymbrium orientale**	oriental mustard	UPL
CARYOPHYLLACEAE - Pink Family		
*Spergularia bocconi**	sand spurry	UPL
*Spergularia rubra**	red sandspurry	FAC-
CHENOPODIACEAE - Goosefoot Family		
Atriplex fruticulosa	valley/ball saltbush	FACW

*Chenopodium album**	white goosefoot/lamb's quarters	FAC
Chenopodium sp.	goosefoot	-
CONVOLVULACEAE - Morning-Glory Family		
*Convolvulus arvensis**	bindweed, orchard morningglory	UPL
EUPHORBIACEAE - Spurge Family		
Chamaesyce ocellata ssp. ocellata	contura creek sandmat	UPL
FABACEAE - Legume Family		
Astragalus didymocarpus var. didymocarpus	two seeded milk vetch	UPL
Astragalus oxyphysus	Mt. Diablo milkvetch, Diablo locoweed	UPL
Lotus humistratus	hill/short podded lotus	UPL
Lotus strigosus	hairy lotus	UPL
Lupinus microcarpus var. *microcarpus*	gully/chick lupine	UPL
Lupinus succulentus	arroyo lupine	UPL
*Medicago polymorpha**	burclover	UPL
*Medicago sativa**	alfalfa	UPL
*Melilotus indicus**	sour clover, Indian melilot	FAC
Trifolium ciliolatum	tree clover	UPL
Trifolium gracilentum var. gracilentum	pinpoint clover	UPL
Trifolium variegatum	few flowered clover	FACW
FRANKENIACEAE - Frankenia Family		
Frankenia salina	alkali heath	UPL
JUNCACEAE - Rush Family		
Juncus bufonius var. bufonius	toad rush	FACW+
Juncus bufonius var. congestus	clustered toad rush	FACW+
LAMIACEAE - Mint Family		
*Marrubium vulgare**	horehound	FAC
Trichostema lanceolatum	vinegarweed	UPL
LILIACEAE - Lily Family		
Calochortus venustus	butterfly mariposa	UPL
LOASACEAE - Loasa Family		
Mentzelia affinis	yellow blazingstar	UPL
MALVACEAE - Mallow Family		
Malvella leprosa	alkali weed	FAC
MORACEAE - Mulberry Family		
*Morus alba**	white/silkworm mulberry	NI
MYRSINACEAE - Myrsine Family		
*Anagallis arvensis**	scarlet pimpernel	FAC
ONAGRACEAE - Evening primrose Family		
Clarkia purpurea ssp. quadrivulnera	purple clarkia	UPL
Clarkia unguiculata	elegant clarkia	UPL
Epilobium pygmaeum	smooth spike primrose	UPL
Epilobium sp.	fuchsia	-
PAPAVERACEAE - Poppy Family		
Eschscholzia caespitosa	tufted poppy	UPL
PLANTAGINACEAE - Plantain Family		
Plantago elongata	prairie/annual coast/long leaf plantain	FACW
POACEAE - Grass Family		

*Avena barbata**	slender wild oat	UPL
*Avena fatua**	wild oat	UPL
*Bromus diandrus**	ripgut brome	UPL
*Cynodon dactylon**	bermuda grass	FAC
Deschampsia danthonioides	annual hairgrass	FACW
Distichlis spicata	saltgrass	FACW
*Koeleria phleoides**	annual junegrass/bristly Koeler's grass	UPL
Leymus triticoides	creeping wild rye	UPL
*Lolium multiflorum**	Italian rye grass	UPL
*Lolium perenne**	English/perennial rye grass	FAC
Melica harfordii	Harford's melic	UPL
Melica imperfecta	small flowered/California melica	UPL
Nassella pulchra	purple needle grass	UPL
*Phalaris aquatica**	harding grass	FAC+
*Poa annua**	annual bluegrass	FACW-
*Polypogon monspeliensis**	rabbit's foot grass	FACW+
*Triticum aestivum**	common wheat	UPL
*Vulpia myuros var. hirsuta**	hairy rat-tail fescue	FACU
POLEMONIACEAE - Phlox Family		
Gilia angelensis	chaparral gilia	UPL
Leptosiphon ambiguus	Serpentine leptosiphon	UPL
Navarretia pubescens	downy pincushionplant	UPL
POLYGONACEAE - Buckwheat Family		
Chorizanthe membranacea	pink spineflower	UPL
Chorizanthe polygonoides var. polygonoides	knotweed spineflower	UPL
Eriogonum angulosum	anglestem buckwheat	UPL
Eriogonum gracile var. gracile	slender buckwheat	UPL
Hollisteria lanata	false spineflower	UPL
*Polygonum aviculare**	dooryard/oval leaf/common knotweed	FAC
*Rumex crispus**	curly dock	FACW
Rumex salicifolius	willow dock	OBL
Rumex stenophyllus	narrowleaf dock	NI
Rumex sp.	dock	-
RANUNCULACEAE - Buttercup Family		
Delphinium gypsophilum ssp. gypsophilum	Panoche Creek larkspur	UPL
Delphinium recurvatum	recurved larkspur	UPL
SCROPHULARIACEAE - Figwort Family		
Castilleja attenuata	valley tassels	UPL
SOLANACEAE - Nightshade Family		
Datura wrightii	thornapple/jimsonweed	UPL
*Nicotiana acuminata var. multiflora**	many flowered tobacco	UPL
THEMIDACEAE - Cluster Lily Family		
Bloomeria crocea	common goldenstar	UPL
Brodiaea terrestris ssp. kernensis	Kern brodiaea	UPL
VERBENACEAE - Verbena Family		
Verbena lasiostachys	common verbena/vervain	FAC-
ZYGOPHYLLACEAE - Caltrop Family		

*Tribulus terrestris**	puncture vine	UPL

APPENDIX B: PLANTS OBSERVED ON THE SITE BY SECTION

The table below details the plant species observed on the Panoche Valley solar farm site by section during the rare plant surveys conducted by LOA from May through July 2010.

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Achyrachaena mollis			x		x				x		
Amaranthus blitoides	x				x			x			x
Ambrosia acanthicarpa									x		
Amsinckia tessellata									x		x
*Anagallis arvensis**					x						
*Anthemis cotula**									x		
Artemisia douglasiana								x		x	
Asclepias fascicularis			x	x					x	x	
Astragalus didymocarpus var. didymocarpus		x	x	x	x			x	x	x	
Astragalus oxyphysus	x			x	x				x		x
Atriplex fruticulosa		x	x								x
*Avena barbata**					x						
*Avena fatua**			x	x	x	x				x	
Baccharis salicifolia			x								
Blepharizonia sp.						x		x	x	x	x
Bloomeria crocea		x								x	
Brodiaea terrestris ssp. kernensis					x						
*Bromus diandrus**					x				x		
Calochortus venustus			x				x				x
*Carduus pycnocephalus**			x								
Castilleja attenuata									x		
*Centaurea melitensis**	x				x	x	x				
Chaenactis fremontii											x
Chamaesyce ocellata ssp. ocellata	x	x	x	x	x	x	x	x	x	x	x
*Chenopodium album**								x	x		x
Chenopodium sp.		x							x		x
Chorizanthe membranacea			x								
Chorizanthe polygonoides var. polygonoides			x								
Clarkia purpurea ssp. quadrivulnera	x	x	x	x	x	x	x	x	x	x	x
Clarkia unguiculata								x			
*Convolvulus arvensis**	x	x	x				x	x			
Conyza canadensis								x			
*Cynodon dactylon**				x	x					x	
Datura wrightii								x		x	
Daucus pusillus		x	x								
Deinandra kelloggii		x	x	x	x	x	x	x	x	x	
Delphinium cf. recurvatum							x				
Deschampsia danthonioides				x							

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
*Descurainia sophia**		x									
Distichlis spicata									x		
Epilobium pygmaeum										x	
Epilobium sp.		x									
Eriogonum angulosum					x		x	x		x	x
Eriogonum gracile var. gracile				x							
Eriogonum gracillimum								x			x
Eschscholzia caespitosa								x			
Euthamia occidentalis									x		
Frankenia salina		x					x	x			
Gilia angelensis					x						x
Gnaphalium sp.					x						
Helianthus annuus								x			
Heliotropium curassavicum								x	x		
Hemizonia congesta ssp. luzulifolia								x			
Heterotheca oregona var. rudis			x								
Hollisteria lanata											x
Holocarpha heermannii										x	
Holocarpha obconica		x	x		x					x	
Holocarpha virgata ssp. virgata		x	x	x	x					x	
*Hypochaeris glabra**		x								x	
*Hypochaeris radicata**			x								
Isocoma acradenia								x			
Isocoma menziesii var. vernonioides							x	x	x		
Iva axillaris ssp. robustior									x		
Juncus bufonius var. bufonius			x	x	x				x	x	
Juncus bufonius var. congestus					x						
*Koeleria phleoides**	x	x		x			x	x	x		x
*Lactuca serriola**		x			x		x	x	x		
Lagophylla ramosissima			x	x	x			x	x	x	
*Lepidium draba ssp. draba**								x			
Leptosiphon ambiguus							x				
Lessingia nemaclada			x					x	x		
Leymus triticoides								x		x	
Logfia filaginoides									x		
*Lolium multiflorum**	x	x		x	x		x				
*Lolium perenne**		x		x	x		x				
Lomatium utriculatum				x				x			
Lotus humistratus			x							x	
Lotus strigosus							x				
Lupinus microcarpus var. *microcarpus*			x						x		
Lupinus succulentus					x				x		
Malvella leprosa								x	x	x	
*Marrubium vulgare**			x						x		
*Medicago polymorpha**					x						
*Medicago sativa**					x						

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Melica harfordii		x									
Melica imperfecta			x								
*Melilotus indicus**				x	x				x		
Mentzelia affinis								x	x		
Micropus californicus var. californicus			x	x							x
Microseris douglasii ssp. *douglasii*				x							
*Morus alba**									x		
Nassella pulchra			x								
Navarretia pubescens		x	x	x	x	x	x	x	x	x	x
*Nicotiana acuminata var. multiflora**								x			
*Phalaris aquatica**								x			
Plagiobothrys stipitatus var. micranthus				x							
Plantago elongata		x									
*Poa annua**					x					x	
*Polygonum aviculare**				x					x		
*Polypogon aviculare**											
*Polypogon monspeliensis**				x				x	x		
Psilocarphus brevissimus var. brevissimus					x						
*Rumex crispus**								x	x		
Rumex salicifolius			x	x	x						
Rumex sp.					x				x		
Rumex stenophyllus								x			
*Salsola tragus**								x			
Sanicula bipinnatifida			x								
*Schismus arabicus**								x			
Senecio aronicoides							x				
Senecio flaccidus var. douglasii									x		
*Senecio vulgaris**									x		
*Sisymbrium irio**	x										
*Sisymbrium orientale**							x				x
*Sonchus asper ssp. asper**									x		
*Sonchus oleraceus**							x	x	x		
*Spergularia bocconi**		x	x	x							
*Spergularia rubra**			x		x				x		
Stephanomeria pauciflora								x	x	x	x
Tragopogon sp.										x	
*Tribulus terrestris**				x	x			x			
Trichostema lanceolatum	x	x	x	x	x	x	x	x	x	x	x
Trifolium ciliolatum									x		
Trifolium gracilentum var. gracilentum					x			x	x		
Trifolium variegatum									x		
*Triticum aestivum**			x	x	x		x	x	x		
Verbena lasiostachys					x			x			
Vulpia microstachys var. ciliata								x			
*Vulpia myuros var. hirsuta**										x	
Xanthium spinosum								x			

Scientific Name	Section										
	3	4	8	9	10	11	13	14	15	16	19E
Xanthium strumarium					x			x	x		

APPENDIX C

CALIFORNIA NATIVE PLANT SOCIETY BOTANICAL SURVEY GUIDELINES
&
GUIDELINES FOR ASSESSING THE EFFECTS OF PROPOSED PROJECT ON RARE, THREATENED AND ENDANGERED PLANTS AND NATURAL COMMUNITIES BY THE RESOURCE AGENCY OF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

CNPS Botanical Survey Guidelines

(from CNPS *Inventory*, 6th Edition, 2001)

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how surveys should be conducted, and what information should be contained in the survey report. The California Native Plant Society recommends that lead agencies not accept the results of surveys unless they are conducted and reported according to these guidelines.

1. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all botanical resources, including special status plants (rare, threatened, and endangered plants) and plant (vegetation) communities. Special status plants are not limited to those that have been listed by state and federal agencies but include any plants that, based on all available data, can be shown to be rare, threatened, or endangered under the following definitions:

A species, subspecies, or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.[1]

Rare plant (vegetation) communities are those communities that are of highly limited distribution. These communities may or may not contain special status plants. The most current version of the California Natural Diversity Database's *List of California Terrestrial Natural Communities*[2] should be used as a guide to the names and status of communities.

Consistent with the California Native Plant Society's goal of preserving plant biodiversity on a regional and local scale, and with California Environmental Quality Act environmental impact assessment criteria[3], surveys should also assess impacts to locally significant plants. Both plants and plant communities can be considered significant if their local occurrence is on the outer limits of known distribution, a range extension, a rediscovery, or rare or uncommon in a local context (such as within a county or region). Lead agencies should address impacts to these locally unique botanical resources regardless of their status elsewhere in the state.

2. Botanical surveys must be conducted to determine if, or to the extent that, special status or locally significant plants and plant communities will be affected by a proposed project when any natural vegetation occurs on the site and the project has the potential for direct or indirect effects on vegetation.

3. Those conducting botanical surveys must possess the following qualifications:

a. Experience conducting floristic field surveys;
b. Knowledge of plant taxonomy and plant community ecology and classification;
c. Familiarity with the plants of the area, including special status and locally significant plants;
d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
e. Experience with analyzing impacts of a project on native plants and communities.

4. Botanical surveys should be conducted in a manner that will locate any special status or locally significant plants or plant communities that may be present. Specifically, botanical surveys should be:

a. Conducted in the field at the proper times of year when special status and locally significant plants are both evident and identifiable. When special status plants are known to occur in the type(s) of habitat present in the project area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the plants are identifiable at the time of survey.
b. Floristic in nature. A floristic survey requires that every plant observed be identified to species, subspecies, or variety as applicable. In order to properly characterize the site, a complete list of plants observed on the site shall be included in every botanical survey report. In addition, a sufficient number of visits spaced

throughout the growing season is necessary to prepare an accurate inventory of all plants that exist on the site. The number of visits and the timing between visits must be determined by geographic location, the plant communities present, and the weather patterns of the year(s) in which the surveys are conducted.

c. Conducted in a manner that is consistent with conservation ethics and accepted plant collection and documentation techniques[4,5]. Collections (voucher specimens) of special status and locally significant plants should be made, unless such actions would jeopardize the continued existence of the population. A single sheet should be collected and deposited at a recognized public herbarium for future reference. All collections shall be made in accordance with applicable state and federal permit requirements. Photography may be used to document plant identification only when the population cannot withstand collection of voucher specimens.
d. Conducted using systematic field techniques in all habitats of the site to ensure a thorough coverage of potential impact areas. All habitats within the project site must be surveyed thoroughly in order to properly inventory and document the plants present. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity.
e. Well documented. When a special status plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form, accompanied by a copy of the appropriate portion of a 7.5-minute topographic map with the occurrence mapped, shall be completed, included within the survey report, and separately submitted to the California Natural Diversity Database. Population boundaries should be mapped as accurately as possible. The number of individuals in each population should be counted or estimated, as appropriate.

5. Complete reports of botanical surveys shall be included with all environmental assessment documents, including Negative Declarations and Mitigated Negative Declarations, Timber Harvesting Plans, Environmental Impact Reports, and Environmental Impact Statements. Survey reports shall contain the following information:

a. Project location and description, including:
    1. A detailed map of the location and footprint of the proposed project.
    2. A detailed description of the proposed project, including one-time activities and ongoing activities that may affect botanical resources.
    3. A description of the general biological setting of the project area.
b. Methods, including:
    1. Survey methods for each of the habitats present, and rationale for the methods used.
    2. Description of reference site(s) visited and phenological development of the target special status plants, with an assessment of any conditions differing from the project site that may affect their identification.
    3. Dates of surveys and rationale for timing and intervals; names of personnel conducting the surveys; and total hours spent in the field for each surveyor on each date.
    4. Location of deposited voucher specimens and herbaria visited.
c. Results, including:
    1. A description and map of the vegetation communities on the project site. The current standard for vegetation classification, *A Manual of California Vegetation*[6], should be used as a basis for the habitat descriptions and the vegetation map. If another vegetation classification system is used, the report must reference the system and provide the reason for its use.
    2. A description of the phenology of each of the plant communities at the time of each survey date.
    3. A list of all plants observed on the project site using accepted scientific nomenclature, along with any special status designation. The reference(s) used for scientific nomenclature shall be cited.
    4. Written description and detailed map(s) showing the location of each special status or locally significant plant found, the size of each population, and method used to estimate or census the population.
    5. Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms and accompanying maps.
d. Discussion, including:
    1. Any factors that may have affected the results of the surveys (e.g., drought, human disturbance, recent fire).
    2. Discussion of any special local or range-wide significance of any plant population or community on the site.
    3. An assessment of potential impacts. This shall include a map showing the distribution of special status and locally significant plants and communities on the site in relation to the proposed activities. Direct, indirect, and cumulative impacts to the plants and communities shall be discussed.
    4. Recommended measures to avoid and/or minimize direct, indirect, and cumulative impacts.

e. References cited and persons contacted.
f. Qualifications of field personnel including any special experience with the habitats and special status plants present on the site.

3.3.2 References Cited

[1] California Environmental Quality Act Guidelines, §15065 and §15380.

[2] List of California Terrestrial Natural Communities. California Department of Fish and Game Natural Diversity Database. Sacramento, CA.

[3] California Environmental Quality Act Guidelines, Appendix G (Initial Study Environmental Checklist).

[4] Collecting Guidelines and Documentation Techniques. California Native Plant Society Policy (adopted March 4, 1995).

[5] Ferren, W.R., Jr., D.L. Magney, and T.A. Sholars. 1995. The Future of California Floristics and Systematics: Collecting Guidelines and Documentation Techniques. *Madroño* 42(2):197-210.

[6] Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, CA. 471 pp.

Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities

State of California
CALIFORNIA NATURAL RESOURCES AGENCY
Department of Fish and Game
November 24, 2009[1]

INTRODUCTION AND PURPOSE

The conservation of special status native plants and their habitats, as well as natural communities, is integral to maintaining biological diversity. The purpose of these protocols is to facilitate a consistent and systematic approach to the survey and assessment of special status native plants and natural communities so that reliable information is produced and the potential of locating a special status plant species or natural community is maximized. They may also help those who prepare and review environmental documents determine when a botanical survey is needed, how field surveys may be conducted, what information to include in a survey report, and what qualifications to consider for surveyors. The protocols may help avoid delays caused when inadequate biological information is provided during the environmental review process; assist lead, trustee and responsible reviewing agencies to make an informed decision regarding the direct, indirect, and cumulative effects of a proposed development, activity, or action on special status native plants and natural communities; meet California Environmental Quality Act (CEQA)[2] requirements for adequate disclosure of potential impacts; and conserve public trust resources.

DEPARTMENT OF FISH AND GAME TRUSTEE AND RESPONSIBLE AGENCY MISSION

The mission of the Department of Fish and Game (DFG) is to manage California's diverse wildlife and native plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. DFG has jurisdiction over the conservation, protection, and management of wildlife, native plants, and habitat necessary to maintain biologically sustainable populations (Fish and Game Code §1802). DFG, as trustee agency under CEQA §15386, provides expertise in reviewing and commenting on environmental documents and makes protocols regarding potential negative impacts to those resources held in trust for the people of California.

Certain species are in danger of extinction because their habitats have been severely reduced in acreage, are threatened with destruction or adverse modification, or because of a combination of these and other factors. The California Endangered Species Act (CESA) provides additional protections for such species, including take prohibitions (Fish and Game Code §2050 *et seq.*). As a responsible agency, DFG has the authority to issue permits for the take of species listed under CESA if the take is incidental to an otherwise lawful activity; DFG has determined that the impacts of the take have been minimized and fully mitigated; and, the take would not jeopardize the continued existence of the species (Fish and Game Code §2081). Surveys are one of the preliminary steps to detect a listed or special status plant species or natural community that may be impacted significantly by a project.

DEFINITIONS

Botanical surveys provide information used to determine the potential environmental effects of proposed projects on all special status plants and natural communities as required by law (i.e., CEQA, CESA, and Federal Endangered Species Act (ESA)). Some key terms in this document appear in **bold font** for assistance in use of the document.

For the purposes of this document, **special status plants** include all plant species that meet one or more of the following criteria[3]:

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1 This document replaces the DFG document entitled "Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities."

2 http://ceres.ca.gov/ceqa/

3 Adapted from the East Alameda County Conservation Strategy available at http://www.fws.gov/sacramento/EACCS/Documents/080228_Species_Evaluation_EACCS.pdf

- Listed or proposed for listing as threatened or endangered under ESA or candidates for possible future listing as threatened or endangered under the ESA (50 CFR §17.12).

- Listed[4] or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 *et seq.*). A species, subspecies, or variety of plant is **endangered** when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is **threatened** when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067).

- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 *et seq*.). A plant is **rare** when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).

- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:

  - Species considered by the California Native Plant Society (CNPS) to be "rare, threatened or endangered in California" (Lists 1A, 1B and 2);

  - Species that may warrant consideration on the basis of local significance or recent biological information[5];

  - Some species included on the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2008)[6].

- Considered a **locally significant species,** that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or a species occurring on an uncommon soil type.

Special status natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special status species or their habitat. The most current version of the Department's *List of California Terrestrial Natural Communities*[7] indicates which natural communities are of special status given the current state of the California classification.

Most types of wetlands and riparian communities are considered special status natural communities due to their limited distribution in California. These natural communities often contain special status plants such as those described above. These protocols may be used in conjunction with protocols formulated by other agencies, for example, those developed by the U.S. Army Corps of Engineers to delineate jurisdictional wetlands[8] or by the U.S. Fish and Wildlife Service to survey for the presence of special status plants[9].

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4 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

5 In general, CNPS List 3 plants (plants about which more information is needed) and List 4 plants (plants of limited distribution) may not warrant consideration under CEQA §15380. These plants may be included on special status plant lists such as those developed by counties where they would be addressed under CEQA §15380. List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not. List 3 and 4 plants are also included in the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List.* [Refer to the current online published list available at: http://www.dfg.ca.gov/biogeodata.] Data on Lists 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking.

6 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

7 http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf. The rare natural communities are asterisked on this list.

8 http://www.wetlands.com/regs/tlpge02e.htm

9 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

BOTANICAL SURVEYS

Conduct botanical surveys prior to the commencement of any activities that may modify vegetation, such as clearing, mowing, or ground-breaking activities. It is appropriate to conduct a botanical field survey when:

- Natural (or naturalized) vegetation occurs on the site, and it is unknown if special status plant species or natural communities occur on the site, and the project has the potential for direct or indirect effects on vegetation; or
- Special status plants or natural communities have historically been identified on the project site; or
- Special status plants or natural communities occur on sites with similar physical and biological properties as the project site.

SURVEY OBJECTIVES

Conduct field surveys in a manner which maximizes the likelihood of locating special status plant species or special status natural communities that may be present. Surveys should be **floristic in nature**, meaning that every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status. "Focused surveys" that are limited to habitats known to support special status species or are restricted to lists of likely potential species are not considered floristic in nature and are not adequate to identify all plant taxa on site to the level necessary to determine rarity and listing status. Include a list of plants and natural communities detected on the site for each botanical survey conducted. More than one field visit may be necessary to adequately capture the floristic diversity of a site. An indication of the prevalence (estimated total numbers, percent cover, density, etc.) of the species and communities on the site is also useful to assess the significance of a particular population.

SURVEY PREPARATION

Before field surveys are conducted, compile relevant botanical information in the general project area to provide a regional context for the investigators. Consult the CNDDB[10] and BIOS[11] for known occurrences of special status plants and natural communities in the project area prior to field surveys. Generally, identify vegetation and habitat types potentially occurring in the project area based on biological and physical properties of the site and surrounding ecoregion[12], unless a larger assessment area is appropriate. Then, develop a list of special status plants with the potential to occur within these vegetation types. This list can serve as a tool for the investigators and facilitate the use of reference sites; however, special status plants on site might not be limited to those on the list. Field surveys and subsequent reporting should be comprehensive and floristic in nature and not restricted to or focused only on this list. Include in the survey report the list of potential special status species and natural communities, and the list of references used to compile the background botanical information for the site.

SURVEY EXTENT

Surveys should be comprehensive over the entire site, including areas that will be directly or indirectly impacted by the project. Adjoining properties should also be surveyed where direct or indirect project effects, such as those from fuel modification or herbicide application, could potentially extend offsite. Pre-project surveys restricted to known CNDDB rare plant locations may not identify all special status plants and communities present and do not provide a sufficient level of information to determine potential impacts.

FIELD SURVEY METHOD

Conduct surveys using **systematic field techniques** in all habitats of the site to ensure thorough coverage of potential impact areas. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity, which determines the distance at which plants can be identified. Conduct surveys by walking over the entire site to ensure thorough coverage, noting all plant taxa

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10 Available at http://www.dfg.ca.gov/biogeodata/cnddb

11 http://www.bios.dfg.ca.gov/

12 Ecological Subregions of California, available at http://www.fs.fed.us/r5/projects/ecoregions/toc.htm

observed. The level of effort should be sufficient to provide comprehensive reporting. For example, one person-hour per eight acres per survey date is needed for a comprehensive field survey in grassland with medium diversity and moderate terrain[13], with additional time allocated for species identification.

TIMING AND NUMBER OF VISITS

Conduct surveys in the field at the time of year when species are both evident and identifiable. Usually this is during flowering or fruiting. Space visits throughout the growing season to accurately determine what plants exist on site. Many times this may involve multiple visits to the same site (e.g. in early, mid, and late-season for flowering plants) to capture the floristic diversity at a level necessary to determine if special status plants are present[14]. The timing and number of visits are determined by geographic location, the natural communities present, and the weather patterns of the year(s) in which the surveys are conducted.

REFERENCE SITES

When special status plants are known to occur in the type(s) of habitat present in the project area, observe reference sites (nearby accessible occurrences of the plants) to determine whether those species are identifiable at the time of the survey and to obtain a visual image of the target species, associated habitat, and associated natural community.

USE OF EXISTING SURVEYS

For some sites, floristic inventories or special status plant surveys may already exist. Additional surveys may be necessary for the following reasons:

- Surveys are not current[15]; or
- Surveys were conducted in natural systems that commonly experience year to year fluctuations such as periods of drought or flooding (e.g. vernal pool habitats or riverine systems); or
- Surveys are not comprehensive in nature; or fire history, land use, physical conditions of the site, or climatic conditions have changed since the last survey was conducted[16]; or
- Surveys were conducted in natural systems where special status plants may not be observed if an annual above ground phase is not visible (e.g. flowers from a bulb); or
- Changes in vegetation or species distribution may have occurred since the last survey was conducted, due to habitat alteration, fluctuations in species abundance and/or seed bank dynamics.

NEGATIVE SURVEYS

Adverse conditions may prevent investigators from determining the presence of, or accurately identifying, some species in potential habitat of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any given year. Discuss such conditions in the report.

The failure to locate a known special status plant occurrence during one field season does not constitute evidence that this plant occurrence no longer exists at this location, particularly if adverse conditions are present. For example, surveys over a number of years may be necessary if the species is an annual plant having a persistent, long-lived seed bank and is known not to germinate every year. Visits to the site in more

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13 Adapted from U.S. Fish and Wildlife Service kit fox survey guidelines available at www.fws.gov/sacramento/es/documents/kitfox_no_protocol.pdf

14 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

15 Habitats, such as grasslands or desert plant communities that have annual and short-lived perennial plants as major floristic components may require yearly surveys to accurately document baseline conditions for purposes of impact assessment. In forested areas, however, surveys at intervals of five years may adequately represent current conditions. For forested areas, refer to "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

16 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/botanicalinventories.pdf

than one year increase the likelihood of detection of a special status plant especially if conditions change. To further substantiate negative findings for a known occurrence, a visit to a nearby reference site may ensure that the timing of the survey was appropriate.

REPORTING AND DATA COLLECTION

Adequate information about special status plants and natural communities present in a project area will enable reviewing agencies and the public to effectively assess potential impacts to special status plants or natural communities[17] and will guide the development of minimization and mitigation measures. The next section describes necessary information to assess impacts. For comprehensive, systematic surveys where no special status species or natural communities were found, reporting and data collection responsibilities for investigators remain as described below, excluding specific occurrence information.

SPECIAL STATUS PLANT OR NATURAL COMMUNITY OBSERVATIONS

Record the following information for locations of each special status plant or natural community detected during a field survey of a project site.

- A detailed map (1:24,000 or larger) showing locations and boundaries of each special status species occurrence or natural community found as related to the proposed project. Mark occurrences and boundaries as accurately as possible. Locations documented by use of global positioning system (GPS) coordinates must include the datum[18] in which they were collected;
- The site-specific characteristics of occurrences, such as associated species, habitat and microhabitat, structure of vegetation, topographic features, soil type, texture, and soil parent material. If the species is associated with a wetland, provide a description of the direction of flow and integrity of surface or subsurface hydrology and adjacent off-site hydrological influences as appropriate;
- The number of individuals in each special status plant population as counted (if population is small) or estimated (if population is large);
- If applicable, information about the percentage of individuals in each life stage such as seedlings vs. reproductive individuals;
- The number of individuals of the species per unit area, identifying areas of relatively high, medium and low density of the species over the project site; and
- Digital images of the target species and representative habitats to support information and descriptions.

FIELD SURVEY FORMS

When a special status plant or natural community is located, complete and submit to the CNDDB a California Native Species (or Community) Field Survey Form[19] or equivalent written report, accompanied by a copy of the relevant portion of a 7.5 minute topographic map with the occurrence mapped. Present locations documented by use of GPS coordinates in map and digital form. Data submitted in digital form must include the datum[20] in which it was collected. If a potentially undescribed special status natural community is found on the site, document it with a Rapid Assessment or Relevé form[21] and submit it with the CNDDB form.

VOUCHER COLLECTION

Voucher specimens provide verifiable documentation of species presence and identification as well as a public record of conditions. This information is vital to all conservation efforts. Collection of voucher specimens should

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17 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata. For Timber Harvest Plans (THPs) please refer to the "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

18 NAD83, NAD27 or WGS84

19 http://www.dfg.ca.gov/biogeodata

20 NAD83, NAD27 or WGS84

21 http://www.dfg.ca.gov/biogeodata/vegcamp/veg_publications_protocols.asp

be conducted in a manner that is consistent with conservation ethics, and is in accordance with applicable state and federal permit requirements (e.g. incidental take permit, scientific collection permit). Voucher collections of special status species (or suspected special status species) should be made only when such actions would not jeopardize the continued existence of the population or species.

Deposit voucher specimens with an indexed regional herbarium[22] no later than 60 days after the collections have been made. Digital imagery can be used to supplement plant identification and document habitat. Record all relevant permittee names and permit numbers on specimen labels. A collecting permit is required prior to the collection of State-listed plant species[23].

BOTANICAL SURVEY REPORTS

Include reports of botanical field surveys containing the following information with project environmental documents:

- **Project and site description**
  - A description of the proposed project;
  - A detailed map of the project location and study area that identifies topographic and landscape features and includes a north arrow and bar scale; and,
  - A written description of the biological setting, including vegetation[24] and structure of the vegetation; geological and hydrological characteristics; and land use or management history.
- **Detailed description of survey methodology and results**
  - Dates of field surveys (indicating which areas were surveyed on which dates), name of field investigator(s), and total person-hours spent on field surveys;
  - A discussion of how the timing of the surveys affects the comprehensiveness of the survey;
  - A list of potential special status species or natural communities;
  - A description of the area surveyed relative to the project area;
  - References cited, persons contacted, and herbaria visited;
  - Description of reference site(s), if visited, and phenological development of special status plant(s);
  - A list of all taxa occurring on the project site. Identify plants to the taxonomic level necessary to determine whether or not they are a special status species;
  - Any use of existing surveys and a discussion of applicability to this project;
  - A discussion of the potential for a false negative survey;
  - Provide detailed data and maps for all special plants detected. Information specified above under the headings “Special Status Plant or Natural Community Observations,” and “Field Survey Forms,” should be provided for locations of each special status plant detected;
  - Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms should be sent to the CNDDB and included in the environmental document as an Appendix. It is not necessary to submit entire environmental documents to the CNDDB; and,
  - The location of voucher specimens, if collected.

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22 For a complete list of indexed herbaria, see: Holmgren, P., N. Holmgren and L. Barnett. 1990. Index Herbariorum, Part 1: Herbaria of the World. New York Botanic Garden, Bronx, New York. 693 pp. Or: http://www.nybg.org/bsci/ih/ih.html

23 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

24 A vegetation map that uses the National Vegetation Classification System (http://biology.usgs.gov/npsveg/nvcs.html), for example *A Manual of California Vegetation*, and highlights any special status natural communities. If another vegetation classification system is used, the report should reference the system, provide the reason for its use, and provide a crosswalk to the National Vegetation Classification System.

- **Assessment of potential impacts**
  - A discussion of the significance of special status plant populations in the project area considering nearby populations and total species distribution;
  - A discussion of the significance of special status natural communities in the project area considering nearby occurrences and natural community distribution;
  - A discussion of direct, indirect, and cumulative impacts to the plants and natural communities;
  - A discussion of threats, including those from invasive species, to the plants and natural communities;
  - A discussion of the degree of impact, if any, of the proposed project on unoccupied, potential habitat of the species;
  - A discussion of the immediacy of potential impacts; and,
  - Recommended measures to avoid, minimize, or mitigate impacts.

QUALIFICATIONS

Botanical consultants should possess the following qualifications:

- Knowledge of plant taxonomy and natural community ecology;
- Familiarity with the plants of the area, including special status species;
- Familiarity with natural communities of the area, including special status natural communities;
- Experience conducting floristic field surveys or experience with floristic surveys conducted under the direction of an experienced surveyor;
- Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
- Experience with analyzing impacts of development on native plant species and natural communities.

SUGGESTED REFERENCES

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APPENDIX D

DELPHINIUM FOUND WITHIN THE PANOCHE SURVEY AREA (MEMORANDUM FROM DR. JAMES PAULUS)

Memorandum May 3, 2010

To: Davinna Ohlson, project manager
From: Jim Paulus

RE: Delphinium found within the Panoche survey area

Populations of native perennial herbs of the genus *Delphinium* were located in Sections 4, 8, 9 and 19 during surveys conducted in March and April. At least one individual in each located population was exhibiting flowers either upon initial detection or when the population was revisited by the project botanist. Identification to species at each location therefore was based upon available leaf, stem and flower characters. In addition, one individual in Section 8 was excavated in order to observe below-ground characters such as root length and strength of the stem attachment.

Plants in Sections 9 were assigned to the relatively common species *D. patens* ssp. *patens*, based upon above-ground characters exhibited by blooming individuals. Plants identified as *D. patens* ssp. *patens* had relatively dark purple-blue sepals, and petals of similar coloration except for whitish margins and white hairs on the upper surfaces. White petals would be expected of both *D. recurvatum* and *D. gypsophilum*. In addition, the flowers exhibited by *D. patens* were relatively small and crowded in comparison to flowers produced by populations located in other Sections. Sepal spurs were consistently less than 10 mm in length, lateral sepals were less than 15 mm in length, and inflorescence internodes were generally less than 20 mm apart. Plants of *D. recurvatum* or *D. gypsophilum* may be expected to produce at least some flowers of greater overall size and greater spacing within the inflorescence. Finally, the lower stems of *D. patens* in Section 9 were consistently glabrous, but were never glaucous and did not appear as reddish as the stems of *Delphinium* located elsewhere within the survey area.

Plants in Section 19 were assigned to the species *D. gypsophilum* ssp. *gypsophilum* (CNPS 4.2, no state or federal listing), based upon above-ground characters. These plants produced up to 25 flowers per inflorescence, spaced up to 3.5 cm apart and held on pedicels of 10-20 mm length. In general, these plants were robust relative to populations found elsewhere within the survey area, with some individuals standing greater than 1 m tall. The expected size of the stem and inflorescence would be smaller for *D. recurvatum*, which is described as generally less than 60 cm tall and with more crowded flowers due to pedicels spaced generally less than 2.5 cm apart. Also, the plants at had exhibited strongly glaucous lower stems, which is typical of *D. gypsophilum* ssp. *gypsophilum*, but not described in literature sources for *D. recurvatum*. Plants in Section 19 exhibited whitish flowers, with little variation between the sepal and petal colors. Some individuals had a small amount of blue in the sepals, which were observed to be reflexed relatively little (or none) even on older flowers. In contrast, *D. recurvatum* flowers would be generally expected to show greater contrast between sepals (bluish) and petals (white), with reflexed sepals. Characters that did not evoke confident separation included the leaves, which were at most ciliate along the edges, and petals that on some individuals were hairier on the inner surfaces relative to the outer surfaces. Expected characters for *D. gypsophilum* would include puberulent leaf margins and equally hairy petal surfaces.

Plants in Sections 4 and 8 could not be confidently separated from the rare species *D. recurvatum* (CNPS 1B.1, no state or federal listing), based upon above-ground characters and below-ground characters of one individual excavated in Section 8. These plants, comprising eight separate groupings (one in Section 8 and seven in Section 4), generally exhibited greater variation in color of petals and sepals, with some plants having light purple-blue sepals that strongly contrasted with the white petals (Figure 1). No plants

in these groups were observed to achieve greater than 60 cm overall height. Stems were observed to be consistently reddish and glabrous, but not glaucous. Inflorescence size (ie, pedicel spacing and length, number of flowers) was consistent with the size expected for *D. recurvatum*, with less than 10 flowers held on glabrous pedicels (ascending at 45 degrees) spaced at about 2 cm apart. Finally, the root system investigated in Section 8 (Figure 2) was highly branched, with a narrowed but firm attachment to the stem. Some plants within each of these groups (all located within an area of about one square mile) exhibited often strong variation in these characters, making positive identification to the species level of taxa difficult. For example, sepal coloration and reflexion varied considerably, with sepal color ranging from white to slightly pinkish (Figure 3) to slightly or rather strongly bluish (Figure 1), and older flowers attaining a range of barely to strongly reflexed. This variability was observed on at least one occasion to occur on a single individual. Petal hairiness with regard to overall amount of hairs and contrast between inner and outer surfaces was also variable, although all plants exhibited some degree of white-hairiness on both the inner and outer surfaces. Leaves were never puberulent, appearing overall glabrous but upon close inspection having ciliate hairs on leaf margins and thus resembling plants separated as *D. gypsophilum* in Section 19. Like all other *Delphinium* found within the survey area except *D. patens* in Section 9, plants in Sections 4 and 8 developed darkish, often greenish, central sepal spots, which is not a character described in the available literature or appearing in herbaria specimen photographs of *D. recurvatum*.

As of this writing, it is speculated that some hybridization has occurred among the *Delphinium* that now populate portions of Sections 4 and 8. Hybridization would account for the relatively high inter- and intra-group variability, and is a generally well-documented trait of local *Delphinium* species. This known tendency for hybridization is thought to be more commonly realized in areas that have been significantly disturbed, and disturbance is certainly in force within the habitat where these plants were found. This area (the flatlands at and near Sections 4 and 8) likely once supported alkaline scrub vegetation, but has been historically used for pasture. It now supports heavily grazed non-native grasslands. Sections 4 and 8 where *Delphinium* populations have survived do not exhibit the tillage lines found in other Sections. The tentatively assigned *Delphinium recurvatum* remains there (despite grazing disturbance), but has possibly responded to habitat alteration by becoming hybridized with other locally occurring species such as *D. gypsophilum* ssp. *gypsophilum* or *D. hesperium* ssp. *pallescens*. It is likely that revisiting all of the populations located in Sections 4 and 8 during fruit and seed maturation will allow more confident assignation to the species level of taxa.

Figure 1. Delphinium cf. recurvatum, Section 4

Figure 3. Delphinium cf. recurvatum, Section 4

Figure 2. Delphinium cf. recurvatum, Section 8